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ABSTRACT

Recognizing the perceived conflict between a belief in the value of play to early childhood development and a commitment to an early childhood pedagogical framework, this book attempts to validate play as a fundamental component of learning and an avenue through which learning outcomes can be identified and confirmed. The book is designed to enable curriculum developers and teachers to combine play with the curriculum and student progress profiles in eight key learning areas: English, Mathematics, The Arts, Studies of Society and Environment, Technology, Languages Other than English, Health and Physical Education, and Science. Play is at the forefront of outcomes-based education as an analysis tool for profiling children, and a context in which children's knowledge and abilities can be assessed. The chapters are: (1) "Profiling Children through Play: An Introduction" (Marilyn Fleer); (2) "Studies of Society and Environment--Using Play To Work towards Planned Outcomes" (Sue Dockett); (3) "Supporting Science Learning through Imaginative Play" (Marilyn Fleer and Gilda Segal); (4) "Science and Play" (Helen Sharp); (5) "Playing Around with Technology: Children Creating Multiple Learning Pathways" (Marilyn Fleer and others); (6) "Play and the Mathematics Profile" (Penny Skinner); and (7) "Play and the Language Profiles and Scales" (Laurie Makin). Contains approximately 100 references. (KDFB)

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Play through the profiles:

Profiles through play

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Edited by Marilyn Fleer

Play through the profiles:

Profiles through play

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Foreword

Early childhood teachers have long valued play as a vital component of young children's learning. However, this belief in the value of play, has often produced tension in terms of justifying learning in Key Learning Areas whilst retaining an early childhood pedagogical framework. In many school settings informal learning and play based programs appear to be in conflict with school learning as it is generally recognised. The chapters of this book seek to validate play not only as a fundamental component of learning, but also as an avenue through which learning outcomes can identified and confirmed.

The material contained in the book was initially presented to the Australian Capital Territory (ACT) early childhood teachers in a professional development project funded by the Commonwealth Government through the National Professional Development Program. That program encouraged both teacher professional development and the establishment of educational partnerships throughout Australia.

In 1994 the ACT Branch of the Australian Early Childhood Association, Inc., the University of Canberra and the ACT Department of Education and Training collaborated to establish a project funded under the national program. This ACT Early Childhood project was specifically designed for the professional development of early childhood teachers in ACT schools and preschools. The initial focus was to identify the fundamental principle valued by early childhood teachers in their approach to teaching and learning, and the second focus considered those principles in relation to curriculum areas. This process clearly articulated early childhood philosophy, but it also raised some concerns among participants who believed that there was tension between early childhood practice and outcomes based education.

In seeking to extend the Project in 1995 it was necessary to address the issues raised by participants the previous year, and also to stimulate teachers to explore ways in which the Profiles could enhance and complement their early childhood practice. The Management Committee, together with the two Project Officers, planned a series of seminars which integrated early childhood philosophy with teaching and learning outcomes in key learning areas. This series titled 'Play through the Profiles and the Profiles through Play' drew on the knowledge of early childhood experts from the ACT and beyond. The material presented at these seminars will be available to early childhood educators Australia wide as a result of this publication.

Marita Corra
Peronelle Windeyer

Project Officers ACT Early Childhood Project
1994 & 1995 National Professional Development Program

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We would like to acknowledge the contribution of the National Professional Development Program in making it possible for the material to be presented, and of the Australian Early Childhood Association, Inc., in making it widely available through the publication of this book.

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Wendy Newman has taught in government preschools and child care centres in the ACT. She is particularly interested in the area of technology as a learning centre for children. She has participated in research investigating young children's understanding of various science concepts and is currently developing programs which explore mathematical concepts in the areas of art and music.

Gilda Segal is a lecturer in science and technology education at the University of Technology, Sydney. Her research interests are in gender and early childhood science education.

Helen Sharp is a lecturer in primary science and technology at the University of Technology, Sydney. She has 17 year's experience as a primary school teacher with an emphasis on early childhood education. Helen has vast experience planning, implementing and evaluating professional development programs for primary teachers and is published widely in the area of primary science and technology education. She is co-author of a series of books for primary school teachers on teaching chemistry in the primary school. Her main areas of research interest are in science and technology education and environmental education in the early years of schooling.

Marita Corra and **Peronelle Windeyer** are practising teachers in ACT Government preschools. Their involvement as Project Officers for the ACT Early Childhood Project of the National Professional Development Program is a reflection of their deep commitment to excellence in practice in the field of early childhood education.

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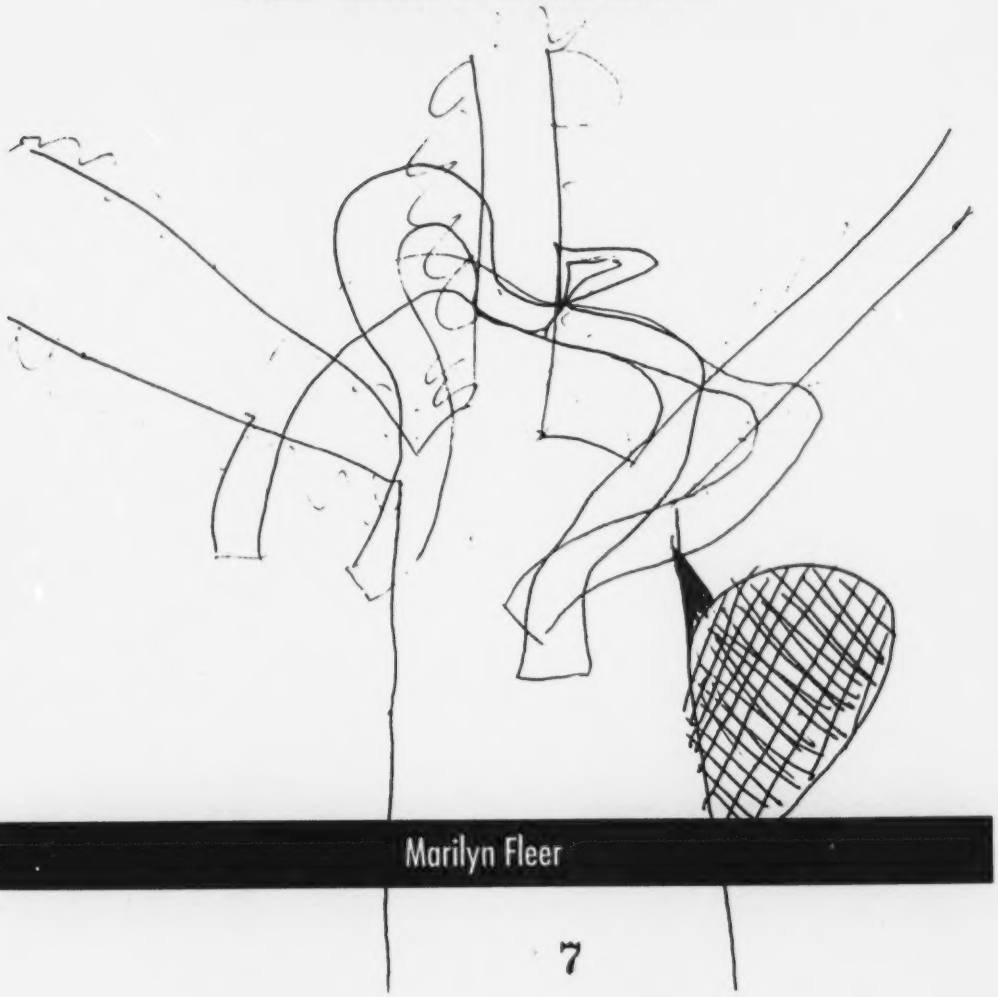
Chapter 1

Profiling children through play: An introduction



Marilyn Fleer

Introduction

National statements and profiles in each of the eight key learning areas (Curriculum Corporation 1994) were released in Australia in 1994. Areas covered were:

- English;
- Mathematics;
- The Arts;
- Studies of Society and Environment;
- Technology;
- Languages Other Than English (LOTE);
- Health and Physical Education; and
- Science.

National collaboration saw not just the publication of these documents, but the facilitation of curriculum planning within Australian States and Territories according to local needs, priorities and strategic plans. The statements provided a framework for curriculum development in each of the key learning areas, whilst the profiles 'described the progression of learning typically achieved by students' (Curriculum Corporation 1994, p.1).

As a result of this national curriculum activity teachers in many States and Territories have been encouraged to use the profiles to help them develop a profile of each child's knowledge and understandings in the eight key learning areas. Similarly, locally-developed curriculum material has been provided to teachers for planning learning experiences. These documents primarily focus on *outcomes*.

Outcomes-based education is qualitatively different from behaviourist driven models of curriculum planning. This type of education utilises observation and assessment for profiling children, rather than developing a series of behaviourally-stated objectives for learning, with a view to using this information to plan learning experiences in which specific learning outcomes will result (when a child is given the opportunity to engage in those experiences).

Alongside the drive for outcomes-based education has been the concern for not losing play-based learning experiences in early childhood education. The challenge has been for curriculum developers and teachers to consider how these documents can be used in ways which build upon early childhood pedagogy. Some States have specifically called upon early childhood specialists to consider this challenge and to develop suitable curriculum material which utilises play.

Play through the profiles: Profiles through play puts play at the forefront of outcomes-based education. In particular, play is seen as a powerful analysis tool for profiling children, as well as providing a context in which children's knowledge and abilities can be meaningfully assessed. For example, when children are engaged in play, they are usually self-motivated, their activities sustained over contexts and time, and they have a sense of purpose for accomplishing tasks. It is more likely that an assessment of their actual abilities can be obtained in such contexts.

Play is also seen as central to planning learning opportunities in each of the eight key learning areas. Each chapter of *Play through the profiles* makes a contribution towards using play for the implementation of the curriculum statements and profiles. The key learning areas of: Studies of Society and Environment; Science; Technology; Mathematics; English and LOTE are featured specifically in this book.

This chapter introduces the focus and content of the book through briefly reviewing some of the literature on play in order to set the context. A full review is beyond the scope of this book. This section is followed by a summary of each of the chapters.

Who is this book for?

Great variability exists in the nomenclature as well as beginning age for school entry. As a result, the take-up of the national statements and profiles is inclusive of five-year-olds in some States such as the Australian Capital Territory but not others such as Western Australia. However, *Play through the profiles* has been developed specifically to cater for the needs of all children aged between four and eight years regardless of their educational setting. Some chapters focus specifically on children in preschools, whilst others target the first years in school. This book is for teachers of children in preschool and the early years of school.

What do we mean by play?

The term 'play' means different things to different people. There is great confusion with regard to this term, since people often assume that the meaning framework they hold for this construct is the same as the person with whom they are speaking (Hutt et al., 1989). Similarly, the literature on play yields a multitude of definitions. Many researchers have '*noted the difficulty of listing attributes associated with the concept of play and the risk of reducing play to a series of features which, when recombined, may not necessarily capture the essential nature of play*' (Dockett 1994, p.55). As a result, many researchers focus their work on the function of play. For example, Cohen (1987, p.3–4) demonstrates this so eloquently in his list of definitions:

> *The function of play has been commented on for many centuries, to little avail.* (Erving Goffman, sociologist 1976)

> *Play is a child's life and the means by which he [sic] comes to understand the world he lives in.* (Susan Isaacs, psychoanalyst 1933)

> *Fantasy play can reveal a great deal of materials but any kind of play can be used defensively.* (Anna Freud, psychologist 1984)

Differences in defining play have been noted across the centuries. The following 'Classical theories of play' have been included for those interested in finding out more about the theories.

Classical theories of play

It has only been since Rousseau's (1759) *Emile* that play has featured at all in the education literature (Cohen 1987). Rousseau's work was most influential in shaping educationalists such as Pestalozzi, Froebel and Montessori. Play was seen as liberating the potential of children. Each educationalist focused on how play could be purposefully utilised in education. This focus was contrary to the original writings on play which suggested that play should be valued in its own right. Although most research in this area has acknowledged the value of play for its own sake, efforts have concentrated more on the value of play for educating children (Cohen 1987).

Classical theories of play, although not directly relevant to views of play today, are important in situating current thinking (Gilmore 1971). For example, the surplus energy theory of play (e.g. Schiller 1875; Spencer 1873); the relaxation theory of play (e.g. Lazarus 1883; Patrick 1916), the

preexercise theory of play (e.g. Groos 1898) and the recapitulation theory of play (e.g. Hall 1907).

The surplus energy theory of play can be best described as children releasing their surplus energy, acquired as a result of being freed from the task of self-preservation. This theory sees play as the meaningless or goal-less activity of children which results in releasing energy. For example, in this theory pushing a wooden block around the room or wrapping a cloth around a block and rocking it across the body would be seen as something the child needed to do in order to release energy.

The relaxation theory of play attributes the purpose of play to replenishing spent energy. Gilmore (1971, p.313) argues that play *not only replenishes energy for the as-yet-unfamiliar cognitive activities of the child, but, because it also reflects 'deep-rooted race habits'...play is the one activity that shows very little build-up of inhibition over time*. For example, this theory would attribute the play of a child such as pushing a wooden block around the room or wrapping a cloth around a block and rocking it in its arms as something the child needed to do because it was too tired to do anything else.

The pre-exercise theory of play focuses on the biological or instinctual behaviours of children. This theory advocates that these instinctive behaviours are practices with the view to their use later in life. In the example of the block cited above, the children would be rocking the block or moving the block around the floor in preparation for parenting and life skills such as driving a car.

Finally the recapitulation theory of play argues the exact opposite of pre-exercise theory. Recapitulation theory suggests that the play of children is concentrated upon ridding the organism of redundant instinctual skills carried over as a result of heredity. Gilmore (1971, p.314) in citing the example of child making a cloth toy 'go to sleep' suggest that this episode would fit into the *category of a vestigal primitive behaviour, perhaps magicoreligious in original intent*.

Since the writing of the classical theories of play, there has been a great deal of speculation regarding the purposes of play by contemporary theorist such as Piaget (1951), Freud (1905; 1950), Erikson (1963) and others such as Vygotsky:

> *In their play children project themselves into adult activities of their culture and rehearse their future roles and values. This play is in advance of development...In play a child is always above his [sic] average age, above his daily behaviour, in play it is as though he were a head taller than himself.* (Vygotsky 1978, p.129; cited in Cohen's paper 1987)

Dockett (1994) has argued that one of the main difficulties with defining play has been the fact that '*no specific set of actions or behaviours are equated with play*' (p.56). In citing Bruner, she indicates that play is an approach or mode, not a form of activity or specific content. As a result, Dockett states that:

> *Rather than a set of actions, definitions of play have focused on a set of features or characteristics that together constitute play (p.56).*

Despite the variety of views on play there have really only been three traditions in research into play (Cohen 1987). These are the:

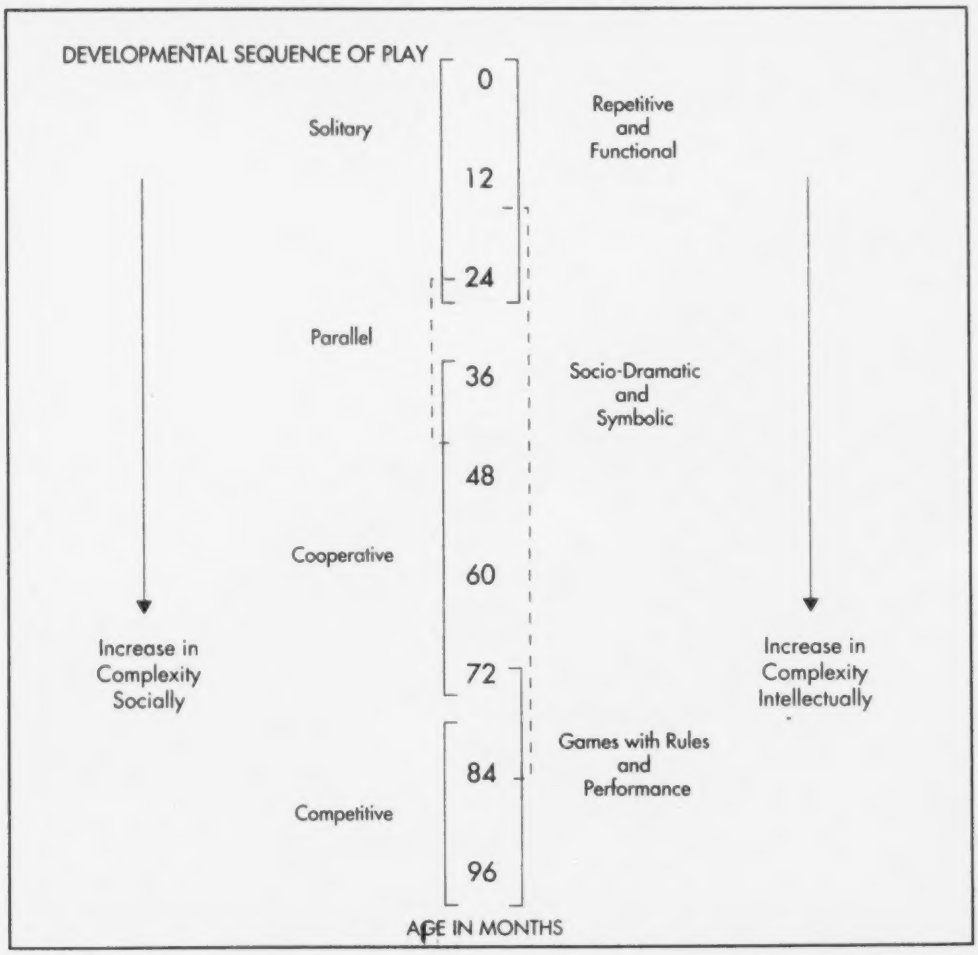
1. Emotional value of play;
2. Social value of play; and
3. Cognitive value of play.

Play through the profiles: Profiles through play focuses specifically on the cognitive value of play, but from within the context that learning can only be maximised when children are interested in the topic, have some control over the direction of the play, and when they are given opportunities to work with others. As a result, the assumption implicit within this book is that learning can only be facilitated when social and emotional needs are also being developed through play. This integrated perspective has not always been considered in the current writings on play.

Current theories of play

Creaser (1990) illustrates the developmental sequence of play for both the social and intellectual domains in Figure One. Here play is shown as concurrently increasing in social and intellectual complexity.

Figure One: Developmental sequence of play (Creaser 1990, p.9)



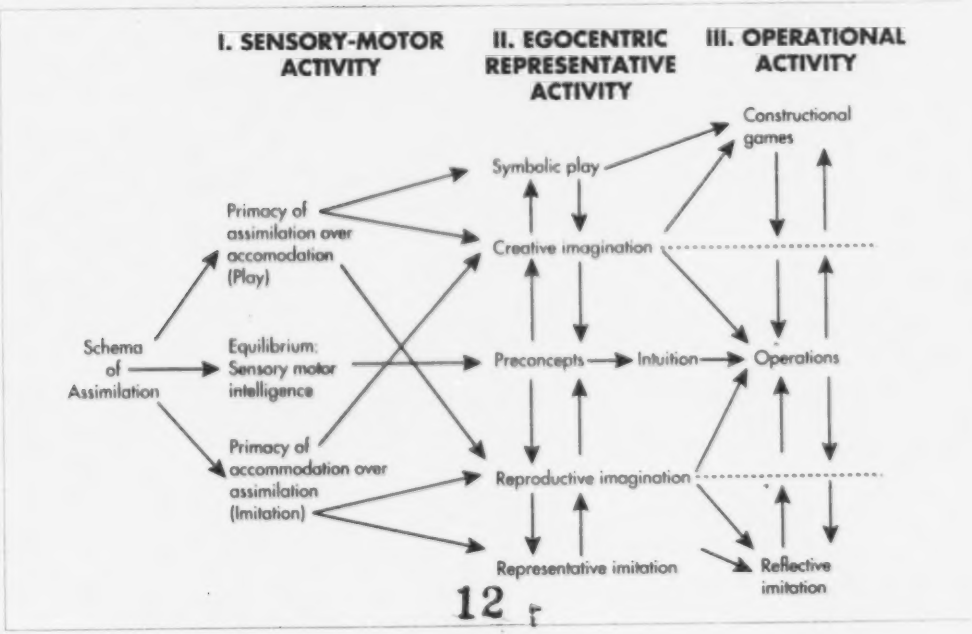
Creaser brings together the literature on play that is frequently cited by early childhood educationalists, particularly practitioners as they work together with children facilitating cognitive, social, affective, physical, and sometimes the spiritual development of children. She pictorially represents the crossover in age groups and likely play activities that may be occurring.

Parten's (1932; 1933) work is reflected in Creaser's figure symbolising the social aspects of a child's development. In summary, Parten describes solitary play as the purposeful activity of the child independent of other children or adults. For example, a child may sit and play with the materials available, but not necessarily interact with another child. Parallel play involves two or more children playing alongside of each other. Their verbal and physical exchanges do not usually involve a common storyline. For example, two children may be playing in the home corner, independently attending to their pretend families' needs. Cooperative play involves a greater social awareness of other children, the storyline being generated through play and the roles of the participants in acting out the storyline. Children work together to create and act out the storylines. In competitive play children involve themselves in rule-based games whereby there is a winner and a loser.

On the other continuum Creaser shows the intellectual development of children, noting particularly three levels of play: repetitive and functional; socio-dramatic and symbolic; and games with rules and performance.

Repetitive and functional play are generally concerned with the use of objects in play. The child focuses on exploring objects to see how they feel, how they move and what they will do. There has also been a great deal of research into how children use objects as symbols in their play (Cohen 1987). Symbolic or pretend play involves a more sophisticated form of play with or without objects. Children can play games which involve only their imagination and their actions, such as pretending to round up the sheep and move them into pens for shearing. Although no objects are used, the children act out the scene using actions and words. Finally, games with rules and performance involves structure and rules—this stage of development in play, usually attributed to children of school age, is similar to that described by Parten as competitive play.

Figure Two: The development of imitation and play (Piaget 1951, not numbered)



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Although Creaser's figure demonstrates a linear developmental sequence she states that children do at times re-visit previous forms of play. In Figure Two Piaget's theory of play is detailed. Many of the features of Creaser's model are derived from Piaget's model. This is to be expected as Creaser's model is a comprehensive synthesis of the literature on play that is commonly utilised by researchers and practitioners when analysing children at play.

Piaget's description of play details practice play as the earliest form of play. This type of play can be identified within the sensorimotor period whereby infants and young toddlers engage in repetitive and pleasurable actions. Symbolic play, which takes place after about 18 months, involves practised actions becoming more symbolic, and language and representation featuring extensively in play. At this time, Piaget noted that solitary activity becomes more collaborative in nature, particularly in relation to language use. Interactive play features games with rules and generally occurs between children of five years and above.

Piaget's work on play can be seen clearly in the model presented by Creaser. The literature cited by Creaser was written during the times when theorists were informed by the research of Jean Piaget. Piaget's work has been a strong influence on many theories of development and learning, particularly in relation to play.

Another play theorist who has utilised Piaget's descriptions of play is Sara Smilansky (1968). Her work incorporates the three stages of play attributed to Piaget, but includes an additional level labelled as constructive play. Constructive play is described as a stage of play between functional and dramatic, whereby children use materials such as blocks to construct something that remains once the play has ceased (cited in Dockett 1994, p.57). A comparison of the Piagetian and Smilansky stages of play shows this connection:

Piaget	Smilansky
practice play	functional play
	constructive play
symbolic play	dramatic play
games with rules	games with rules

Dockett (1994) notes in her extensive review of the play literature, that it is Smilansky's model which has been used extensively by researchers, particularly since her work *'has been combined by Rubin (e.g. Rubin, Maioni and Hornung 1976) with Parten's (1932) description of categories of social participation'* (p.57). In Figure Three a matrix is shown that combines Parten and Piaget/Smilansky categories of play (Dockett 1994, p.58):

Figure Three: Matrix combining Parten and Piaget/Smilansky categories of play

Origins of symbolic play	change to representational assim. because of dev. of symbolic function	need for imaginary situation because of new unrealizable tendencies + desires
Developmental outcomes of symbolic play	temporary mechanism for consideration of schemas; action-based support for not-yet-independent mental representations	zone of proximal development; seperates meaning from objects + actions
Functions of symbolic play	consolidation, but also pleasure of mastery, recapturing and reconstituting experience	generalized tension reduction + wish fulfillment

When Creaser's cognitive-social model is compared with the work of Vygotsky, who takes a socio-cultural perspective of play, some interesting commonalities—and some contradictions—become evident. If we re-examine the quotation by Vygotsky earlier in this chapter, the implication is that play provides children with opportunities in which they can act out the rules of society they are trying to understand:

> *In their play children project themselves into adult activities of their culture and rehearse their future roles and values.* (Vygotsky 1978, p.129)

Here the children can play cooperatively because they have a shared understanding or common knowledge about their culture. They are able to work at higher levels because the common knowledge shared by the players is understood (Edwards & Mercer 1987). Contrary to Piaget's theory, children are able to decentre (not be egocentric; move beyond their own perspective) as they take on the roles and actions of the adults they are playing out.

Play is in advance of development...(Vygotsky 1978, p.129). When children participate in play which mirrors their world and those of the adults who are a part of it, they are playing at levels beyond their present abilities. Some of this behaviour will be imitative, and only over time will these actions taken have more meaning. However, much of the play will involve children recasting new story lines within the accepted societal framework. In order to do this effectively, it is necessary for children to move into higher realms of intellectual functioning—that is their zone of proximal development. It can be argued then that cognition is leading development and not—as many developmentalists would argue—that children need play opportunities at their developmental level—*In play a child is always above his [sic] average age, above his daily behaviour, in play it is as though he were a head taller than himself (Vygotsky 1978, p.129).*

Finally, the most stark contrast between Vygotsky's work and the previous theories of play is the notion of free play. Vygotsky argued that play cannot ever be seen as free. Children's actions are strictly governed by the rules of the child's culture. In acting out, extending or reconceptualising events, actions or situations in a child's world, the child is contained by culture. If the child moves beyond this, shared understanding across the group is not possible. Figure Four shows a direct comparison of Piaget and Vygotsky on critical issues about symbolic play.

Both Vygotsky and Piaget's developmental psychological theories have been challenged recently by Gaskins and Goncu (1992). They argue that the issue of cultural variations in symbolic play have not been addressed. Their

Figure Four: Comparison of Piaget and Vygotsky on critical issues about symbolic play (Gaskins & Goncu 1988, p.104)

	Social categories of play					
	unoccupied	onlooker	solitary	parallel	associative	cooperative
Cognitive categories						
functional						
constructive						
dramatic						
games-with-rules						

Play as a tool for learning

research on the symbolic play of Mayan children indicates that play is not valued by their elders, occurs comparatively less, and does not involve the imaginative transformation which formed the basis for Vygotsky and Piaget's theories of play. The much cited work of Smilansky (1968) could also be critiqued in a similar way. She studied disadvantaged preschool children mostly from Middle Eastern and North African countries and compared them with children from high sociocultural backgrounds from European countries. She noted in her introduction that:

> *We were, however, astonished to learn that children from the low sociocultural strata* play very little *and most of them* do not participate in sociodramatic play at all. (Smilansky 1968, p.4)

Perhaps these differences are more cultural than socioeconomic. The assumptions inherent in particular theories of play need to be considered when viewing the research evidence cited. Nevertheless, in industrialised countries socio-dramatic play is something that young children engage in for long periods of time in the first five years of life (if you consider a Piagetian view point) or beyond (if you take a Vygotskian perspective). Views on the function of this play for children have ranged from the need to expend surplus energy through to playing for sheer pleasure. A great deal of research and speculation abound in the literature on the purpose of play for children. Many educationalists have been less interested in the purpose for children, but rather have sought to find ways of harnessing play as a pedagogical tool for facilitating learning in young children. Some of the commonly cited theories of play have been discussed briefly in this chapter. This literature underpins contemporary thinking in this area and has influenced practice in Australian schools and preschools. Many of the contributors to this book have utilised the research literature on play in developing their views on play and the profiles. If we return to Bruner's idea that play is not content, but rather a mode of operation, then we can see that the content described in this book is that of the key learning areas. However, the mode of operation is play. Each chapter author details the content and the mode and discusses how they come together in practice in centres and classrooms.

A summary of the each of the chapters follows.

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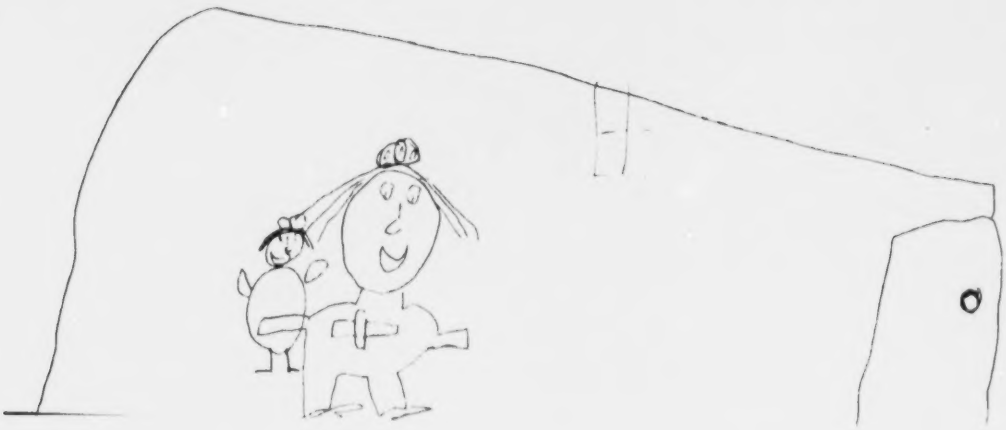


The outcomes

Consistent with outcomes-based education, the contributors to the inservice program described in the Foreword, produced papers focused on many (but not all) of the curriculum statements and profiles. Each chapter represents a detailed study of a particular key learning area. The style and direction of each chapter is as individual as the writer—thus contributing to the vibrant and interactive nature of this publication.

In the second chapter Sue Dockett outlines the connection between play and the profile of Studies of Society and Environment. Her chapter demonstrates through a transcript of children at imaginative play how they can be profiled in action in terms of their understandings and skills of studies of society and environment.

In critiquing the statement and profile on Studies of Society and Environment, Dockett also outlines how it is possible to utilise the data gained through watching children play—and analysing their skills and knowledge against the profile—in future planning. Included in this chapter is a discussion of the importance of play as a tool for further learning in Studies of Society and Environment. This perspective is discussed further in Fleer and Segal's chapter (Chapter Three) on supporting science learning through imaginative play.

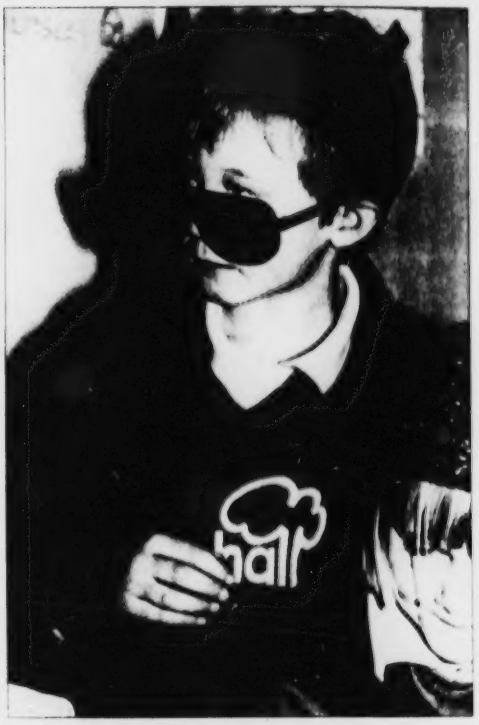
The thesis of their chapter is that children can explore a range of challenging and complex scientific ideas if they are given opportunities in which to play. They argue that when an instructional sequence is presented in science, no matter which approach is being adopted, children should be allowed to take the ideas and play with the concepts. It is through playing with the scientific ideas that children come to understand these ideas—particularly where their observations do not always match what is being shared. For example, in their chapter they talk about preschool children playing with the intuitive inconsistency of a sea sponge being an animal—yet it holds many of the characteristics of a plant. Similarly, they detail a play scenario of two children who were involved in a unit on light, who were through play, trying to further their understandings of the sun and how light travels. Through playing out their ideas and pretending to be investigating, the children were provided with another avenue in which to come to understand complex and abstract scientific ideas. This chapter is followed by

another chapter on science written by Helen Sharp.

In Sharp's chapter she details a number of practical ways in which children can be stimulated to play with scientific ideas. She argues that children should be provided with a range of hands-on resources as well as play opportunities in the classroom. She believes that children should not only play freely with the materials, but be given some focus questions to challenge their thinking further. This type of play commonly known as constructionist play has been demonstrated by researchers to be an important part of how children learn (Creaser 1990).

This chapter is followed by a discussion of how imaginative situations can be created in preschools and schools which foster children's imaginative play in technology. Fleer, Corra and Newman present details of two play scenarios—one in a preschool and the other in a school. In the first example, the children are provided with an empty room and are asked to decide on what they would like to plan for in that room. The children decide upon the creation of a fairy room. However, what they do and how they go about it was determined by their beliefs about fairies. For example, one group believed fairies were no bigger than their middle finger and set about making accessories for the fairy room to that scale. Another group believed fairies lived under mushrooms and built a fairy village during outside time in the outdoor area. Hence, the children constructed freely, but within the rules they had set as a result of their belief system about fairies.

The other play scenario in their chapter involved the children creating imaginary creatures for a lonely creature that was found in the teacher's garden and brought in to school (hidden inside a basket). Although the children did not have to participate, the stimulus of the lonely creature was so great that most did. Many Mummy creatures were created to keep the lonely creature company. Similarly, a range of animals were made such as a giraffe, sheep or crocodile.



Investigating light through play

In both play scenarios a great deal of technological activity was occurring. Both teachers utilised the design, make and appraise approach with materials as a way of assisting the children play effectively. In the first instance the teachers used the stimulus of the imagination room or lonely creature story to profile what the children were capable of doing—particularly in relation to their planning and appraising skills. This provided both teachers with the opportunity to plan effectively for future technological activities in the preschool and school. The play scenarios described also provided more purpose for the children's technological activities—because they were making something they were going to play with! This of course created a real context for the children's appraisal of what they had made—was it useful for their play, did it hold together, did they need to re-design and what other ideas did they gain from other children's creations—or free play. Children were working

and playing for a purpose—one they had created.

In Chapter Six, Penny Skinner outlines how children can create their own mathematical directions through play. She describes a range of books with flaps which children invent—as their own problem-solving books. She highlights how children label the problems they come up with in their own way—using words which are meaningful to them. This gives the children the opportunity to organise their own constructs to label the patterns or problems they find—and hence they are able to apply these ideas to other contexts or situations. Skinner argues that when children create their own problems, record them in their own way, and give them their own labels, they are playing in a purposeful and meaningful way. This play, when furnished with mathematical language provided by the teacher (in a manner that is supportive, i.e., alongside of the children's labels and experiences), ensures that mathematical learning is optimised.

In the final chapter Laurie Makin brings together the Language Profiles and Scales (English, LOTE and ESL) through a systematic and sensitive discussion of the tensions between child-centred learning and curriculum-centred teaching. Her chapter details three important areas in the process of profiling children. Firstly she discusses child-oriented profiling, where children's home language(s) must be considered in the context of profiling. An holistic approach must be taken, whereby assessment of their development should be in all their languages. She cites the example of inappropriate profiling as being like that of six blind people each describing a different part of an elephant and making assessments about what an elephant was like.

The second area she discusses in her chapter is that of communication-based assessment. It is her view that assessment of progress must be contextualised within communicative needs and intent, since they drive language. She outlines four competencies. They are discourse competence, sociocultural competence,

Children creating their own mathematical problems for others to solve

functional competence, and linguistic competence.

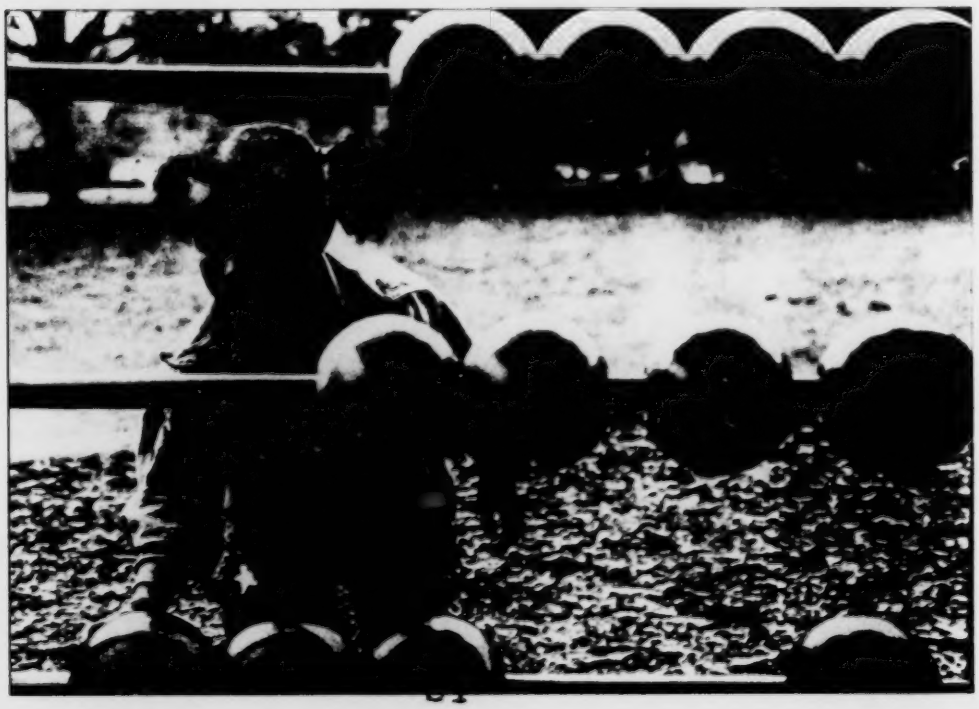
The third area addressed in her chapter focuses on the development of language competence in the context of teacher talk. Makin argues that play-based programs can facilitate language development since group talk provides only restricted language interactions. She cites numerous studies which demonstrate that both school and preschool teachers' interactional styles generally do little to move children's language competence further.

Makin suggests that when the Profiles and Scales are used to make judgements about children in terms of expected curriculum outcomes, they can be detrimental. '*However, if they are used as a way of understanding children's emerging interests and abilities, they can provide teachers with useful information on which to base planning.*' Her chapter provides a thorough analysis of the literature in supporting her claims on the former and her discussions of play-based programs within contemporary thinking on language development provide valuable suggestions about how to go about the latter.

Conclusion

In common belief and common practice in most industrial societies play is taken to be the main feature of childhood, but little consideration is given to its relevance for development or for learning. If this weren't so, there would surely be much more play taking place in primary (not to mention secondary) schools (Newman & Holzman 1993, p.94).

This book is about refocusing teachers' attention on play in schools with a view to it being a useful analysis tool for profiling children and a powerful pedagogical technique for optimising learning. The chapters that follow provide a range of ways for this to occur in each of the eight key learning areas.



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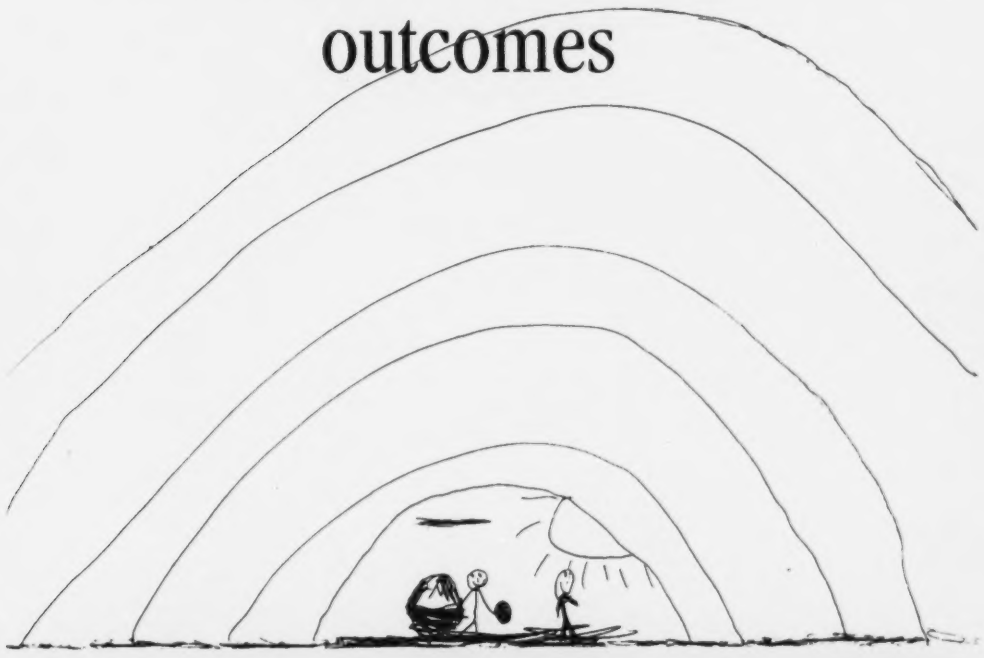
Chapter 2

Studies of society and environment—using play to work towards planned outcomes



Sue Dockett

The importance of play within the early years has been acknowledged for some time. With the introduction of outcomes-based approaches to teaching and learning, there has been some concern among early childhood teachers that the importance of play may be lost in a push to measure or define specific outcomes for each child.

This chapter suggests that play need not be abandoned when using an outcomes-based approach: rather, it is suggested that play provides an ideal opportunity for children to demonstrate and to test their knowledge, skills and understandings—and for teachers to observe, challenge and further develop these understandings.

Following a discussion on the importance of play, the value of play as a vehicle for observing children's understandings is discussed and suggestions are made for ways in which the information gained through play observations may be used in planning in the area of Studies of Society and Environment.

The importance of play

A program based on play has benefits for both children and teachers. Not only does it provide the context and the means to promote learning and teaching, it also establishes a range of opportunities for teachers to gather evidence and to document children's learning. Children demonstrate a range of understandings about themselves and others and about the actions of themselves and others in their play. This is particularly so when children are playing with their friends and where the situation is an emotionally-charged one. At these times, it is important for children to consider the perspectives of others, to work out why someone might be acting in a particular way, and to use a range of negotiation and interaction strategies to support and maintain the play. These skills provide the basis for children learning about themselves and about other people, learning about their own and others' actions and interactions, and learning about the roles and responsibilities of people in specific contexts.

As children engage in such experiences, teachers have the opportunity to collect a range of data and to relate this to their overall picture of individual children and to the outcomes of specific curriculum areas. The planning of future experiences can draw upon this information, as well as the teacher's awareness of developmentally appropriate practice, the relevant syllabus documents and the general trends of learning and development. Combined in this way, children's play forms an integral part of the planning process. In addition, play provides a forum in which observations of children may be linked to the outcomes associated with specific curriculum areas.

Apart from the multitude of benefits afforded children through play, teachers have a lot to gain by implementing a program based on play. Play provides opportunities for observation, data collection and assessment. Future learning experiences may then be planned based on this information. In overview, teachers may use play to:

- observe
- collect data and documentation
- assess
- plan future experiences

(Dockett & Lambert 1996)

When children engage in play, they do so at levels which are comfortable for them. That is, they tend to demonstrate their level of understanding of specific issues and to operate at a level which reflects their learning. Through the observation of children in play contexts, teachers can identify the specific needs of individual children, note particular strengths and recognise areas of weakness. When observing children's play, teachers are in a strong position to note levels of mastery or challenge among children and to recognise

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Observing children at play in the sandpit

issues or experiences which have relevance and meaning for that group of children. These observations then may be related to the outcomes towards which children have been working.

Much information is available to teachers from children's play. Documentation of this information may provide a basis for future planning and provide detail to parents, other teachers and the children themselves about their learning. Details of the language used by children, the problem-solving and negotiation strategies employed, the level of understandings of other people that is demonstrated and the awareness of the perceptions of others are all examples of information which may be collected through observations of children's play. These observations can then be used to plan future experiences, or to assess the achievement of specific outcomes (Dockett 1995; Dockett & Lambert 1996).

Many individual differences among children may be obvious during play. As noted by Dockett and Lambert (1996) 'play experiences not only provide the opportunity for teachers to observe these individual differences, but also provide a means by which teachers may plan to meet these individual differences. The one play experience may cater for the individual needs of several children' (p.13).

Within a play context, teachers may note the interactions among individual children, the interactions of various groups of children, the actions of individual children, and the nature and direction of the play. It may become clear that one child prefers to interact with a few other children only, or that another child is often excluded from the play. Further observations may suggest that the second child is unaware of the general direction of the play and unable to adopt a particular role that would gain entry. In addition to identifying an area in which this child was uncomfortable, this observation provides some options for future planning. The teacher may plan to add some relevant props and to provide some verbal guidance in order to give the child some assistance in determining how entry may be achieved.

Play, then, is one example of an experience which can meet the needs of individual children. In planning for play, teachers may choose to focus on an area which presents problems for one child (e.g., setting up a shop experience for a child who is having difficulty understanding addition or subtraction) or may plan play experiences which relate to issues relevant to a whole class (e.g., providing props to facilitate the re-enactment of a bus trip). Through the provision of planned play

experiences, teachers can add complexity and enrichment to children's play. In doing so, teachers are matching children's interests with challenging, yet meaningful, experiences (Dockett & Lambert 1996).

Teachers play a vital part in promoting, supporting and facilitating play. As the creators of learning environments in early childhood settings, teachers are responsible for the opportunities provided for play. The degree to which children demonstrate specific outcomes in their play depends upon these opportunities. Where play is supported for substantial periods of time, rather than a few minutes before lunch or recess, and where children know that the products of their play can remain standing for a few days, complex play is more likely to result. Teachers make a difference to the play of children, both by their direct and indirect actions. Teachers who support and encourage play, and who act to complicate, extend and enrich that play, are likely to observe a wide range of outcomes which relate to children's actual competencies. They can then reflect issues which are of importance and value to those children.

Teachers who support play have access to a breadth of information about the children in their charge. This, combined with a sound understanding of the principles of children's growth, development and learning, an understanding of relevant syllabus documents (including outcomes and profiles) and a commitment to the value of play, provides a solid basis for early childhood programs.

Play and Studies of Society and Environment

One of the major focus areas of both the Studies of Society and Environment Curriculum Framework produced by the ACT Department of Education and Training (1994) and the curriculum profile developed for this area (Curriculum Corporation 1994), relates to understanding people, and people's interactions and relationships. Play provides an ideal context in which these understandings may be developed and demonstrated by children.

What data is provided by play?

A wide range of outcomes within Studies of Society and Environment may be identified through play as children interact with a range of equipment, environments and people. Outcomes observed in play will cover many different curriculum areas, reflecting the integrated nature of play and the holistic development of children. The following observation of play indicates one way in which this might occur. It is important to note that play provides one opportunity for collecting a range of information about children's understandings.

The following example of play has been considered as a work sample. From this episode, a great deal of information about children's understandings of themselves and others, and their awareness of interactions and relationships may be identified and related to the outcomes for Studies of Society and Environment. The outcomes listed are those from a number of levels. It is not suggested that one instance of observing these outcomes, or moves towards them, is sufficient to conclude that the outcomes have been attained. Rather, it is important to note which of these the students are working towards and to plan to follow these up as appropriate.

The setting for the play is the family corner area of a Department of School Education preschool. The children involved are both aged four-and-a-half years. The outcomes marked with an asterisk (*) are those from *Towards Level 1*.

Outcome number	Play	Outcome
	Dale and Jean in family area. There are two teddy bears wrapped up in the doll's beds.	* Role play [Interpretations and perspective]
1 1.1 1.8 1.14 2.9	Jean: [to teddies] He's the doctor [points to Dale] You gotta be good for the doctor now, cause your Mum says. If you don't be good, then ya have to stay sick! Come on now, I'm your Mum an' I gotta look after you 'til you get better. I gotta get you the sick food stuff now. When you're sick you gotta have some mush.	1.1 Identifies events and stages in people's lives (role-play at different stages or ages)
1.1	Dale: [Picks up large bag, places on floor] [Looks down at the two teddies in the bed] I'm gonna...[Examines one bear] Now, you go back to bed with your brother.	
1.14 1.18	Jean: Both of 'em sick. They gotta go to sleep. That's what you gotta do when you're sick. My Mum says. Even gotta sleep in the day time when you get sick.	2.9 Describes the roles and responsibilities of members of families and schools
1.17	Dale: Goodnight! [picks up bag, goes down stairs] See ya! [comes back up stairs] Hello! I'm back again. Here's the doctor to make you better.	1.8 Describes diverse ways in which common needs are met (describe shared routines and traditions important to their families)
1.1 1.11	Jean: Sick again! Dale: What's wrong? Here's some medicine for her.	
	[the children change roles and the play continues]	
1.8 1.9	Dale: [goes back upstairs, calls to J.] I'm back. [Looks down at teddies, shakes them] Wake up, wake up! Come on, wake up! Oh no, now don't cry, it's only the doctor coming to make you better. Don't be frightened. I'm here.	1.14 Identifies how rules influence daily life (identify rules in their own family or school)
	[The play continues for some minutes]	
	Jean: [climbs stairs, stops at top] Knock, knock knock knock knock.	1.18 Differentiates between times when it is appropriate to act on personal choice or to follow established rules
	Dale: [shaking teddies] Wake up!	
	Jean: Which one is sick?	
	Dale: That one. [points to one teddy]	
	Jean: No, which one, the boy or the girl?	1.17 Prepares information for an audience (role-play a character from story or life)
	Dale: Boy.	
	Jean: [goes to teddy, kneels near bed, picks up teddy] This is very, very, very, very hard, cause that hurts. [Reaches into bag, pulls out stick, gives teddy an injection. Pulls more things out of bag, places piece of paper on bear, as if it were a Band-aid] Now, you gotta stay in bed. All right? [Replaces teddy in bed]	1.11 Identifies the work done by self and others (identify different kinds of work other people do in the home, school and community)
	Dale: [Looks to teddies] I might give him a needle. You gotta be careful with needles, you know.	
	Jean: [Replaces things in bag, closes it, stands up] Have to come back tomorrow, all right?	1.9 Explores common and unique characteristics among individuals (illustrate common human emotions)
	Dale: Goodbye!	
	Jean: [Walks down stairs]	

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Jean identifies the work done by others in the community

How can this data be used in planning for future experiences?

Play can be an integral part of an outcome-based approach to teaching and learning. Observing children's play can tell us a lot about the understandings they have developed and can provide us with the data we need to assess outcomes. It can also provide us with a range of information to be used in future planning. From the observations collected for individual children, it is possible to build up a picture, or developmental summary, which may well be based on outcomes. This, in turn, may become the basis for future planning for that child within the overall program.

The information to be considered when planning can then include:

- information about individual children, as gained through observations, work samples, discussions with parents, etc.;
- knowledge of the nature and likely directions of children's development and learning; and
- relevant syllabus documents, including National Profile statements.

When all of these aspects are considered, it is likely that the program will be developmentally appropriate (Bredekamp 1987). According to Kostelnik, Soderman and Whiren (1993), three elements form the heart of a developmentally appropriate program:

- an understanding of the general principles of growth and development;
- the adaptation of expectations for individual children; and
- respect for both the child and their uniqueness.

Planning

As an example, it is useful to consider the information we have gained about Jean and Dale in the work sample above as well as other information we have collected and relevant curriculum documents. These are listed in Table 1.

Table 1. Overview of the information available

Age appropriateness	Individual appropriateness	Respect for the individual	Plan (based on syllabus/curriculum documents)
• involved in dramatic and sociodramatic play • working co-operatively in small groups • communication based on both verbal and nonverbal strategies • concept development occurs through observation and interactions with others. • children are motivated to solve problems that are relevant and meaningful for them	pretend play often involves role play of familiar experience, e.g., visiting the doctor, being sick, visits to family members, etc. children have different preferences in choosing play partners. Jean and Dale play together often, in situations where there is reciprocal role play. in this role play, both children use a range of communication strategies and appear to have a range of shared understandings on which the play is based.	Aware that Dale's mother has just been in hospital to have a baby. Dale at times seems uncertain of how he feels about this. Sometimes on arrival he is withdrawn, other times he is eager to show off his new sister. Jean is a confident child who often moves between groups of peers. She is accepted into groups, but often prefers to play alone or in play where she can direct the actions.	Unit of work for this term —Focus question: Who am I? Contributing questions: 1. What are my needs? 2. How are my needs met? 3. Who are important people in my life? 4. How do my needs change? Aim to incorporate a focus on how needs are met by family and community members as part of this unit. Suggested content focus: • children • families • identification of individual and group needs • ways needs are demonstrated • community members/ services that meet needs • ways people meet their own needs Relates to next unit of work: How are people alike and different?

The information listed under the heading *Age appropriateness* is essentially what we might expect of children at a particular point in time. It is based on a knowledge of general trends and patterns in development. Another way to write this section would be to refer to outcome statements. The information listed under *Individual appropriateness* relates some of the knowledge we have about these particular children. This is expanded in the next column, under the heading of *Respect for individuals* where some background about the children is included. Finally, the planned unit of work developed by the classroom teacher is listed.

This step of gathering information is important, but it does not identify particular teaching strategies. This is illustrated in the following table, where the expected patterns or trends of development are noted and where teaching strategies and planned experiences are matched to these. In addition, connections to the planned unit of work and outcomes towards which children may be working while engaged in these experiences, are listed. The outcomes listed relate specifically to the area of Studies of Society and Environment (ACT Department of Education and Training 1994; Curriculum Corporation).

The patterns or directions of development are listed a series of movements along continua, as outlined by Kostelnik et al., (1993). The expectation is that children will move from one end of a continuum to the other over time and that a range of learning experiences may promote this change. Some examples are listed in Table 2. These are not the only trends or directions which may be identified in children's development and learning. They provide an initial framework for incorporating the elements of a developmentally appropriate program, by focussing on what we know about individual children, what we know about expected

Table 2. Relating directions of development to what is known about individual children and to syllabus documents.

SIMPLE TO COMPLEX This pattern is evident in all areas of development and learning. For example, children's concept development moves from an initial classification of people, objects and events into simple categories to more complex categories.	Aim: To continue focus relating to doctors and health, encourage more complex role play through additional props, characters, doctor's surgery, hospital etc. Relates to contributing questions 1, 2. Working towards outcomes: 1.15 Identifies how elements of systems meet their own needs. 2.15 Describes ways people obtain goods and services in the local community.
KNOWN TO UNKNOWN Children move from the familiar, or what is known, to the unfamiliar or unknown.	Aim: To expand connections between what is already known and what can be found out, e.g., What is it like to be in hospital? to be a patient? to be a nurse/doctor? Who could be asked and how could this information be gained? What is it like to be sick? What is medicine and why it is important? What makes something medicinal? Relates to contributing questions 1, 2. Working towards outcomes: 1.10 Identifies resources used and valued. 1.17 Prepares information for an audience.

WHOLE TO PART Children tend to experience things as a whole rather than as a number of parts. This may mean that children will revisit an experience and gain something different from it each time.	Aim: Initially play focuses on the doctor's visit as a whole. Help children to consider the details of the visit, e.g., when do you call a doctor, what happens during a visit to the doctor—examination, discussion, questions, prescription—and why are these important? Relates to contributing questions 2, 3. Working towards outcomes: 1.15 Identifies how elements of systems meet their own needs. 2.15 Describes ways people obtain goods and services in the local community.
CONCRETE TO ABSTRACT Concrete experiences involve real objects. Children explore and use objects, relying on their senses to provide them with information about those objects. Experiences become abstract as fewer senses are involved in the experience.	Aim: Encourage play based on concrete objects as well as the move to more abstract play, e.g., pretend patients instead of real objects, use of props that are not prototypical and use of symbols, e.g., writing on paper to represent a prescription. Relates to contributing questions 1, 2. Working towards outcome: 1.8 Describes diverse ways in which common needs are met
EXPLORATORY TO GOAL DIRECTED As young children grow and develop, they become more goal-directed in their actions. They continue, however, to be interested in exploration of materials and ideas.	Aim: Extend initial exploration of props by adding a variety of extra props, including those which have a specific purpose in the play. For example, exploring a stethoscope before using it in role play and enactment of a visit to the doctor, nurse or hospital. Relates to contributing questions 2, 3, 4. Working towards outcomes: 1.16 Gathers and records information from direct and indirect experiences of people and places. 2.16 Selects, compares and categorises relevant information.
SELF TO OTHER Initially, children are concerned primarily with themselves and see things in relation to themselves. This changes gradually as the perspectives and interests of others become more important to children.	Aim: Pretense starts with the self and then includes others in the adoption of a number of roles and in the taking of different perspectives. In this case, it could be the perspective of the parent, the child, the patient or the doctor. Encourage children to respond according to the perspective being taken and to engage in reciprocal interaction appropriate to that perspective, e.g., parent–child, doctor–patient. Relates to contributing questions 3, 4. Working towards outcomes: 1.9 Explores common and unique characteristics among individuals. 1.11 Identifies the work done by self and others. 2.11 Describes ways in which people cooperate with and depend on one another in their work. 1.18 Differentiates between times when it is appropriate to act on personal choice or to follow established rules.

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patterns of growth, development and learning, a respect for the uniqueness of individuals, and matching these with the expectations outlined in curriculum documents.

While the experiences that are derived from this example fit within the unit of work suggested within the syllabus document, they also reflect an awareness of age and individual appropriateness and show respect for the experiences of the children concerned. In this way, the individual needs, strengths and interests of children may be combined with the requirements of syllabus documents to form the basis of a unit of work which is meaningful and relevant for the children involved. It is also a unit of work which links to the play of children and which aims to promote and add complexity to that play.

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Using play to work towards planned outcomes

Chapter 3

Supporting science learning through imaginative play

Marilyn Fleer and Gilda Segal

Introduction

Sophie: I am the mummy. You can be the sister.

Rowan: Me mummy too. Two mummies (nodding to incite agreement)!

Sophie: Here is your food (dishing out plastic food).

Rowan: (Accepting food) Yumm (making small bites into plastic food).

Sophie: No it's only pretend. You can't really bite it!

Rowan: Yes, pretend. Not really real!

Sophie: Now eat up your food!

As children engage in imaginative play, they learn how to move between an imaginative world and reality. They develop a working knowledge of the concepts of pretend and real. At the same time they engage in a multitude of play scenarios, usually focused on acting out their real world—as in the example above.

The literature on play and early childhood education concentrates on the diversity and value of play for cognitive, social and emotional development of young children (Bateson 1955, 1976; Bretherton 1984; Harris & Kavanaugh 1993; King 1992; Lillard 1993; Smilansky 1990). Although theories of play are often situated in different paradigms and varying contexts, there is general agreement about the need for play as the principal pedagogical tool for learning in the early childhood years. Unfortunately, less is understood about how play can be utilised with school-aged children for facilitating learning in the Key Learning Areas. For example, what relevance does imaginative play hold for learners in science?

This chapter discusses two examples of imaginative play which were initiated by children as a result of being involved in science learning. The first example is in a preschool, where the learning unit featured sea sponges (Fleer 1991). In this scenario, the children play with the idea of a sea sponge being an animal and not a plant. The second example concentrates on the value of play for school-aged children who had completed a unit on light, two months previously (Segal 1995; Segal & Cosgrove 1994).

Imaginative play is variously known as symbolic, representational or pretend play (Bretherton 1984). Smilansky (1990) considers that the terms symbolic and representational are more evocative of mental processes, rather than inclusive of actions during play. She also dismisses the use of the term, role play, which is occasionally used for imaginative play, as too narrow, inferring only the element of taking on a role. Smilansky prefers the terms dramatic play (one player) and sociodramatic play (more than one player) to describe the integration of '*representation, pretense* (sic) *plus reality orientation, organisational skills, reasoning and argumentation, social skills*' together with '*spontaneity and on-going improvisation*' (Smilansky 1990, p.22). The terms pretend play or make-believe play also convey her sense of sociodrama.

Imaginative play with sea sponges

Play is usually arranged in preschools through specifically organised spaces, such as the home corner and the sand pit. The stimulus for play in these spaces are the adjuncts (e.g., dress-ups, vehicles, cups and saucers) and the children

themselves. Sometimes, play results when someone brings in an item from home. The children in our first narrative had just started preschool and their summer holiday experiences were still fresh in their mind. Several children had brought in sea sponges to share for morning news. Joan, the preschool teacher, took advantage of their interest in sea sponges and developed a science unit around the topic. As part of the approach she used (interactive teaching, Biddulph & Osborne 1984), she encouraged the children to draw pictures of what they knew about sea sponges in books she had created specially for the children. She scribed their comments next to their illustrations, talked to them individually about their understandings and encouraged the children to continue drawing, recording any questions they had about sea sponges. The children also recorded the ideas they were investigating in their books (with the teacher scribing their comments).

Many of the children found it difficult to reconcile the scientific classification of sea sponges as animals with their plant-like appearance. The children responded to this intuitive inconsistency by playing with the concept of sponges as animals. This play is illustrated below at group time when Joan, the preschool teacher, read out one child's self-created book on sea sponges.

T: *Now, this is Sian's first page in her book. And it says, 'the diver is looking at the sponge'.*

And that's the sort of sponge that we've got here at preschool. It looks very much like the one we have got.

Her next page says 'another sponge'.

Now this is one, listening, now, this story says, 'there are big waves in the sea. And the people are going to drown. But, the sponge won't because it's real, and the sponge sucks up animals. And then we said, maybe it finds air under the water. How do you think it might find air to breathe under the water?

Anna: *Because there's snorkel.*

T: *Do you think the sponge would have a snorkel?*

C: *No (chorus of laughter). No, can't breathe through it.*

The suggestion of a snorkel was met with great laughter. The children proceeded to play with the idea, as indicated below.

T: *But in Sian's story she said the people were going to drown, but the sponge is not. So we said why is the sponge not going to drown?*

Helen: *Because it stays in the ground and it can't go anywhere else.*

T: *And how does it not drown?*

Anna: *Cause it's got (inaudible).*

Helen: *The sea pushes it.*

Jarrad: *It can't hop out.*

Although the children knew that the sponge was not going to drown, they were unable to provide a scientific explanation. The teacher probed further through questioning:

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T: *But how is it going to breathe?*

Anna: *Snorkel.*

T: *Does it breathe? Do you think it has a snorkel?*

C: *Yes, yes, yes, no, no (mixture of comments from the group).*

Sam: *I think it can just breathe.*

The teacher then encouraged individuals to share their ideas with each other. In the meantime, the teacher said, she would look in a book to try to find the answer.

T: *Chick has an idea. Jerrard?*

Jerrad: *I think it can just find a way to breathe.*

T: *He thinks it can just find a way to breathe. Now I don't know and I just looked up the book, and it didn't tell me. So Hugh can we borrow your encyclopedia again?*

Hugh: *Yes.*

T: *And then we might know, we could read about it, because it had a lot of information, didn't it Jerrard, about sponges?*

At this point the children did not allow the issue to simply be put to the side for later investigation. They returned to their original idea of a snorkel—playing with the inconsistencies it suggested. They controlled the boundaries and invented their own rules for the play.

Anna: *It has snorkels on it.*

T: *Well do you think, Jonty and Jerrard, that the sponge has a snorkel?*

C: *No!! (Laughter).*

T: *Well we will have to see won't we.*
I think now...

Jonty: *Because sponges can't buy.*

T: *They can't...?*

Jonty: *Buy!*

T: *They can't buy things.*

Jonty: *Because they don't have arms.*

T: *They don't have arms.*

Jonty: *Can't move.*

T: *And they can't move.*

Helen: *They don't have money.*

Jonty: *They don't have pockets to keep their money in.*

T: *They don't have pockets to keep their money in.*

Anna: *They don't have money.*

T: *They don't have money.*

In addition to discussions such as these, the children personified the sponge in their play. They compared human characteristics with the sea sponge in an attempt to rule out the snorkel as a mechanism for the sponge not drowning in the water. The role the teacher took was one of supporting the children by accepting or seeking clarification of their ideas, thereby creating further opportunities for children to continue to

explore the uncertainty with which they were grappling.

The play is then taken further as Jerrad makes swimming actions. Self-referencing is a common feature in pretend play.

Jerrad: *And they go like (child demonstrates the swimming action of a sponge).*

T: *Do you think they could swim?*

C: *No (in chorus).*

The teacher used the opportunity to further clarify their thinking through their play by asking the children a question relating to the swimming actions. The children's chorused answer 'No' above, demonstrates how the children simultaneously attended to the pretence of play and the reality of the plant-like appearance of the sponge that was in a mysterious way, classified as an animal.

T: *Why do you think they couldn't do what Jerrard just did?*

Jonty: *Because they are STUCK.*

T: *Because they are stuck.*

Anna: *Because they are planted.*

T: *Because they are planted and stuck into the bottom of the sea.*

The imaginative play evident in the transcript provided a powerful way for the children to explore sea sponges. In previous discussions, the children had been challenged by the notion that a sea sponge was an animal and not a plant. The imaginative play illustrated above provides some insight into how the children were resolving the intuitive inconsistency caused because the sea sponge visually held more plant-like characteristics.

Rarely does imaginative play occur at planned group time since imaginative play is usually controlled by children, whereas the content and direction of discussions are usually teacher-directed, and do not easily accommodate imaginative play. The imaginative play was possible because teacher and children had spent some time physically and mentally exploring sea sponges; in addition, the teacher not only allowed the children to play with their ideas at group time, but actively encouraged them. Thus the group's common knowledge of sea sponges, derived from their investigations of sponges, facilitated not only group sharing, but also play. Imaginative play provided this group of children, all with insights into the same intuitive inconsistency, with opportunities to explore and play with their emerging ideas.

The richness of the play described here was only possible because the children had been involved in a richly constructed and implemented program on sponges. Complex play evolved within the rich learning on sponges—it established the common knowledge utilised by the children for play—which in turn further facilitated learning. Play was a powerful vehicle for coming to understand difficult scientific ideas—ones that seemed counter-intuitive to the children. In the next section, a free-play scenario is described which has also resulted from a rich program—in the area of light.

Imaginative play with light

Very little research has been directed towards finding out how play can be utilised as a pedagogical tool for children's learning beyond the preschool setting. Imaginative play helped the preschool children understand sea sponges and the classification system of animals and plants. Play can also help school-age children learn about science concepts. The following story of two Year 1 children (second year of school in NSW) illustrates how they, when encouraged, also utilised play for learning. The children's class had been engaged in an extended investigation of light and shadows in an integrated unit that occupied over 20 hours of class time. As in the preschool example, children had been encouraged to ask questions, and to write or draw their current understandings in a specially designed book, they called a Light Log.

Two months after the class work was completed, children were interviewed in pairs to gain more insight into their learning about light. The only room available for interviews was a temporarily unoccupied sick room, complete with couch, bookshelves, sink and toys. This is the story of two six-year-old children, who suddenly began to engage in imaginative play during their interview.

'Sarah, do you want to do a play?' asked Stephie, 'Can we do the play now?' (turning to the interviewer).

Of interest to many of the children interviewed that day were the soft toys on the couch and a basket containing toys standing next to the couch. Rummaging in this basket earlier, Stephie had found an attractive pair of sunglasses which she and Sarah had tried on in front of the mirror and through which they had reported seeing a rainbow. This pair of sunglasses was to feature significantly in the play to come.

As their play unfolded, the children pretended to be sisters, who were going to the beach. On arrival, Stephie went for a swim, 'Splash!' while Sarah, settled herself in a (deck) chair on the sand area. Wearing the sun glasses and stretched back in her deck chair, she had a self-satisfied, relaxed smile on her face, reminiscent of someone enjoying warm sunshine. Suddenly, proclaiming: 'Hey, I've found something out. But I'm not quite sure how it works though', Sarah offered the sun glasses to Stephie, saying 'Put these sun glasses on and look at the sun.' The 'sun', was a torch fixed to the sink. Stephie had already incorporated it into their play by making sure that this sun shone upon their beach area.

Sarah continued: 'I can even see it now.' Then, moving to one side on her chair, she looked seriously at the sun and breathed with feeling: 'Wow!' Stephie briefly put on the glasses, stated matter-of-factly she saw a rainbow and reminded her fellow player: 'You haven't even had a swim.' Sarah rejoined in a sing-song, sulky-type voice: 'I don't want one.' 'Let's go home,' replied Stephie, but Sarah, prolonging the game said, 'It's so warm in the sun.' Seemingly tiring of enacting her idea, Stephie repeated 'Let's go home.'

Then, Sarah jumped up and announced firmly, 'I want to find out how the sun works.'

The two children, still in their assumed characters, unselfconsciously acted out an inquiry into how the sun works, using their Light Logs as references for providing answers to a question that Sarah had recorded in her Light Log two months previously.

Asking scientific questions through play: Inquiry into the sun

Wearing the sun glasses, Sarah began her inquiry.

Sarah: 'How come it's so high up? What's it made out of?' and, in quick succession: 'Why is it so far up? How can we get up there?'

Stephie entered the changed scenario without further prompting.

Stephie: Let's try and find out (encouragingly).

Sarah: We'll never get up there (despairing).

Stephie: In a rocket ship? (brightly).

Sarah: Give it a break! We'll never build one of those things.

Slight pause.

Stephie: We could...

Sarah: I know! (with an air of having a good idea about how to solve the problem).

Stephie: O.K. Are we going to jump up there? (standing up on the couch, seemingly ready for action).

Sarah: Definitely not. We are not even going to go up there, we are just going to look.

Stephie standing on the couch, with her hands on her hips as Sarah replied, suddenly ran toward the book shelves, calling:

Stephie: You look and I'll see if I can find anything about it.

Walking up and down and holding the sun glasses on, Sarah eyed the sun with clear investigative intent, while Stephie selected a fiction book from the shelf. Meeting up with Sarah, Stephie claimed to have found out something—the sun is made of coal.

Sarah: But does it run on coal?

Stephie: I don't know, actually.

During their play, Stephie produced a knowledge claim from a book, exemplifying her understanding of one 'face' of science, science as ready-made (Latour 1987). Sarah's understanding of Latour's other face of science as science-in-the-making, was made visible through her generation of a series of questions, culminating in her penetrating question: 'Does it run on coal?' This question is sophisticated, showing that Sarah sees that for her inquiry, it might be necessary to distinguish the composition of the sun from how it works.

As an inquirer, Sarah explored the implications of Stephie's idea by querying one consequence of holding it. Significantly, she did not immediately put forward an idea of her own about how the sun might work, and this had at least three consequences. First, she gave herself time to withhold judgement on Stephie's knowledge claim. Second, her question implied that Stephie's knowledge might be useful to the inquiry underway—a complement to Stephie. Simultaneously the question allowed Stephie time to acknowledge the tentative nature of her

knowledge in a dignified way, an important skill in theory-building in science. Thus Sarah, adeptly, accomplished scientific and social goals by not rejecting Stephie's view explicitly, and not rejecting it implicitly by offering her own opinion too soon.

Scientific investigations through play: Inquiry into the sun

Adopting Stephie's idea of using books as a source of knowledge, Sarah also examined books on the shelf.

Sarah: *I know something about it, come over here Nancy (a continuation of the use of sister names decided earlier in play).*

And reading from her Light Log, she improvised, inserting words about the sun:

Sarah: *Oh, look, the closer you get to something, when you have a torch, or maybe even a sun, the [light from the] bulb gets darker and smaller.*

Stephie, joining in, read from the same Light Log:

Stephie: *The further away you get, the bigger it gets and the lighter it gets. Let's try it.*

Temporarily engaged by checking the observations Sarah had recorded earlier in the year, they examined how the circle of light on the floor varied in brightness and size as the torch is moved away from the floor.

Stephie: *Look, it works, it's true.*

Stephie thus found evidence for Sarah's claim recorded earlier in Sarah's Light Log that the light became less intense, as the torch was raised above the paper. Her investigation again provides access to the sense that they made of their previous experiences during the unit on light, that a knowledge claim can be checked empirically, and that there is worth in reconsidering previous ideas.

Sarah re-directed the investigation.

Sarah: *What are we going to do about the sun? We've got to find out how it works.*

Stephie: *And what it does.*

In the next interlude, reading directly from their Light Logs became a little frustrating, as during their previous writing about their science activities they had recorded nothing about how the sun works. Sarah had partly solved this problem in the conversation above, where she interpolated 'or maybe even a sun' into her sentence about the behaviour of the torch. In the following passage, she took this solution one step further, completely eliminating the problem, by pretending to read something from her Light Log, which was not there.

Sarah: *I'll read it, I'll read it in this book. The sun is made out of fire. (At this point, Stephie looked up at the interviewer and gave her a huge grin of seeming enjoyment of the whole situation. This may have been because of Sarah's pretence of reading.) And nobody knows how it works, because if it's made out of fire.*

Stephie: *Well what about...? Does God? (turning to look at Sarah, who did not look back at her)*

Sarah: *You know what that means. (Continuing to think about the sun being made out of fire.)*

Stephie: *Does God know how it works?*

Sarah: *Well nobody knows whether God does.*

Stephie: *No-one believes in God.*

Sarah: *I do.*

Stephie: *I do (imitating Sarah's tone).*

Sarah: *Here's an experiment. Have a look at the sun, put some sunglasses on and see what you can see. (She was pretending to read this out of her Light Log too.)*

Stephie: *We've done that. I'll show you something.*

Illustrated here again, are the multiple levels and complexities involved in communication in play. Sarah, now, through the device of pretending to read the information, offers an alternative theory, that the sun is made of fire. By incorporating her alternative idea as part of the play, Sarah did not challenge or reject Stephie's notion that the sun is made of coal, even though Stephie herself acknowledged that she was unsure of it. Just as in class, more than one theory was allowed to stand at a time, awaiting further evidence to distinguish the more plausible, intelligible and fruitful one (Posner, Strike, Hewson & Gertzog 1982). Sarah, recommencing her inquiry by looking closely at the sun, may have been about to cite visual evidence for her claim, before Stephie interrupted (but this is conjecture).

The children also gained an insight into each other's belief in God, with Stephie hastily backstepping, presumably yielding to the more acceptable cultural view of religion among six-year-olds, and thereby made sure she did not offend her partner. Thus, play assisted both children to negotiate socially and cognitively, to reflect on their learning in the light unit and develop their learning in a direction dictated by Sarah's interest in her unresolved question about how the sun works.

Discussion

In the example discussed here of sociodrama, sunglasses seemed to be the trigger for the initial transformations which took place but it was only later, that Sarah, and then Stephie, incorporated their science learning as part of the play. If sociodramatic play is a way for children to make meaning of their experiences, it makes sense for teachers to facilitate this kind of reflection, and sometimes to use the play for curriculum and child development evaluative purposes.

There are three ways in which to view this play episode. At its most fundamental and important level, it is a valuable interaction between two children which has helped them to develop cognitively and socially as we have shown previously. More objectively, as an evaluative instrument, it allows access to some of the meaning that Sarah and Stephie have constructed from participating in the unit on light. It also suggests a possible pedagogical strategy for future science learning in early childhood education.

The play as an evaluative tool

In this play episode, Sarah and Stephie displayed, practised and internalised many of the attitudes valued by science educators. They identified a genuine and meaningful problem of their own, brainstormed various ways in which they could gain information to help solve the problem (including direct experimentation and indirect consultation of references), eliminated some suggestions which seemed too extreme, and concentrated their attentions on others. In considering some possibilities, they kept open minds and resolved to find out more information in places not immediately accessible to them. We infer from their play, that Sarah and Stephie have learned some authentic ways in which scientists go about their inquiries.

The play therefore not only makes apparent the children's knowledge of some learning processes in which they have engaged, but it indicates that the freedom to formulate and investigate their own questions during the light unit. Similarly it suggests that the light unit was also an enjoyable experience for the children since they were keen to continue engaging with these processes within their play setting.

Play as a pedagogical tool

Studies in which adults have actively participated in assisting kindergarten children to engage in make-believe play at school report gains in cognitive-creative and socio-emotional activities (Smilansky 1990). Furthermore, according to Johnson's (1990) review of the role of play in cognitive development, sociodramatic play can assist children to take perspectives of others, and negotiate socio-cognitive understanding. Kelly, Carlson and Cunningham (1993) strongly recommend that these sociological aspects of an authentic scientific culture be included in school science curricula; early childhood science education would seem an ideal place to begin this incorporation through sociodramatic play.

There are some potential obstacles. First, although teachers have appropriate equipment within their classrooms for sociodramatic play, they do not usually have such play as a conscious part of their curriculum (Smilansky 1990). This is especially the case once children have moved out of kindergarten (the first year of the schooling in New South Wales). Second, as previously defined, and as investigated through empirical study, play is under children's control. This suggests that both school and preschool teachers, if interested in incorporating opportunities for spontaneous sociodrama as part of science education, would need to provide situations and props which are suggestive of science activities previously undertaken. By the very nature of sociodrama, teachers cannot be prescriptive or enforce structured scenarios on children, but they can actively participate, by joining in the drama if invited, by suggesting roles, by arranging partners, by extending children's conceptions of roles and by discussing some concepts later, in a sensitive, thoughtful fashion. Teachers will need to be highly observant, patient, alert to children's feelings about being observed while playing and most importantly, willing to pass control of the sociodramas to the children.

Sarah looking at the sun: how come it is so high up?

Conclusion

What is immediately evident when reading the two play scenarios detailed in this chapter is how the children utilised play to clarify their scientific thinking. They mentally played with the concepts (animal/plant and light), incorporating them into an imaginary setting. For the preschool children, this play involved attributing human characteristics to the sea sponge, and for the school children it involved incorporating the sun into their play—first as part of a holiday experience, and second as part of a scientific investigation.

Vygotsky (1978, pp.95–96) argued that *'at the beginning every imaginary situation contains rules in a concealed form…'*. For these children the play they engaged in was stimulated by the science work occurring in their centre and classroom. The children were in a sense trying to unravel the scientific rules associated with animal/plant and light/sun respectively. They used imaginative play as the vehicle to do this.

What may not be so evident from reading the transcripts is the extended preceding periods of children's exploration and intellectual engagement with conceptual ideas in both the preschool and school contexts. Those periods in which children tried to make sense of ideas that were puzzling, stimulating and that emerged from contexts that were familiar to them are the common elements in both narratives.

Edwards and Mercer (1987) have argued that optimum learning occurs when common knowledge is developed across the group. In both the preschool and the Year 1 classroom, the children and the teachers had established common knowledge about sponges and light respectively. Because common knowledge had been established, meaningful play could easily be initiated, sustained and developed. Without some form of common understanding across the whole group it would have been difficult for the

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Sian's book on sea sponges: How can it breathe? Does it use a snorkel?

children to engage in imaginative play, particularly the socio-dramatic play engaged in by Sarah and Stephanie. A close analogy is that of humour, whereby adults in particular contexts with common knowledge can and do initiate jokes, which are sustained across time and are progressively developed. People from outside the group usually cannot see the humour, easily engage in the play, or develop it further. What is evident from the two narratives, is that the children would not have been able to 'play scientifically' if a sustained unit on sponges or light had not been occurring—building common knowledge and interest.

Both play scenarios detailed in this chapter also highlight the importance of utilising play as a pedagogical tool in science learning through the opportunities play provides for reflection. Vygotsky (1978, pp.95–96) has also argued that *'every game with rules contains an imaginary situation in a concealed form'*. As children grow older, play seems to become a less important part of their life. There is documented evidence to suggest that socio-dramatic play declines somewhere between the age of six and eight years and that structured games with rules become more prominent (Creaser 1990; Parten 1932). However, it can be argued that culture has an influence on this pattern. Gaskin and Goncu (1992) have provided evidence of this in their research with Mayan children. Where elders did not value symbolic play, comparatively less play was evident. Similarly, Smilansky (1968) noted that *'children from the low sociocultural strata [from Middle Eastern and North African countries] played very little and most of them do not participate in sociodramatic play at all'* when compared with children from high sociocultural backgrounds from European countries. This may be more of reflection of the cultural groups being researched than the socioeconomic background of the children. It can be speculated that the institution of school that all children attend in Australia, with its de-emphasis on socio-dramatic play, may be acting to curtail the playful activities of school age children. What is evident in the second of the

two play scenarios is that when given the opportunity in which to engage in socio-dramatic play, that fruitful learning can be fostered among school age children. More thought and research needs to be directed to this area, since both examples illustrate the power of play in developing children's scientific thinking. Similarly, they highlight how science experiences can also act as a catalyst for developing play as a worthwhile and valued experience for children in the early childhood years.

As teachers we can learn a great deal about teaching and learning by providing play space in our programs and in our classrooms. If we create the space, the children will show us a range of ways learning outcomes can be achieved.

Acknowledegments

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Oh, look! The closer you get to something with a torch, or maybe even a sun, the light gets darker and smaller.

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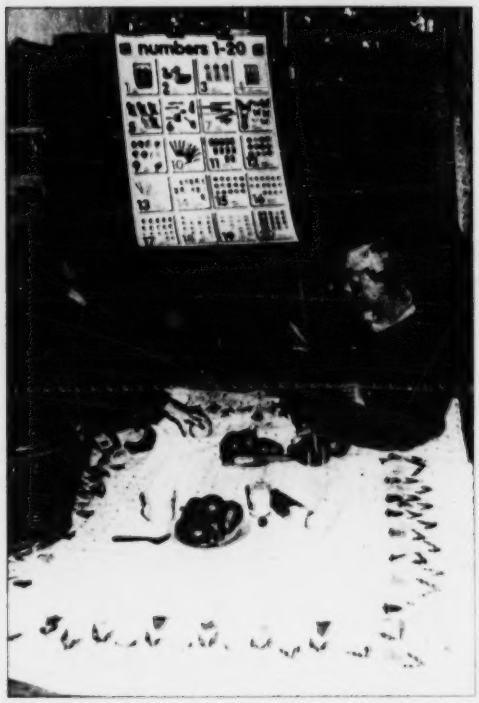

As children engage in imaginative play, they learn how to move between an imaginative world and reality

Segal, G. & Cosgrove, M. (1994) 'I want to find out how the sun works!' Children's sociodramatic play and its potential role in early learning of physical science. *Research in Science Education, 24*, pp.304–312.

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Chapter 4

Science and play

Helen Sharp

If you have ever watched young children at the beach you can't help but notice how much pleasure they get from playing in the sand, splashing about in the water and exploring their surroundings. Wonder, curiosity and excitement are generated by experiences such as these which can help shape and determine the knowledge and understandings that young learners bring with them into the classroom.

Even before entering school, children freely explore their world, investigate new experiences and voice their ideas in order to make sense of what they have observed. Learning takes place while children are playing with their toys, watching a thunderstorm, building tall edifices with building blocks, feeling the wind on their face or enjoying the smell of fresh popcorn. It is through play activities such as these that opportunities for learning are most often realised.

Once children enter school they are confronted by a different set of rules and norms which sometimes makes it difficult for children to express their learning in the same way. The value of play as a means for initiating or developing learning is not always evident in the classroom, regardless of the age of the children.

The purpose of this chapter is to highlight the way play can be used to facilitate learning in science and to alleviate some of the misgivings teachers may have about teaching science in the classroom.

Many teachers find the prospect of teaching science daunting to say the least, let alone science to very young children. They perceive science to be difficult, requiring a lot of knowledge and sophisticated equipment in order for it to be taught and, as a result, science is often left for others to do at some other time.

What is science?

What is science and is it really such a difficult subject to teach? Science aims to make sense of the world in a systematic way. It is a way of describing how things work. Scientists explore events in the environment in order to make observations and acquire information. From these observations they develop different ideas and propose possible solutions to problems which are then tested out. From the results, scientists try to clarify their understanding, based on previous experiences and knowledge, and communicate their understanding in a way which is coherent and logical.

Is this so different from the way young children explore their world? Children engage in play activities in much the same way as a scientist would. Let's go back to the example of playing at the beach and follow through some of these ideas in more detail.

Probably the best way to understand what young learners are doing while they are playing is for you to think about your own learning experiences. Can you remember what it was like as a young child to go to the beach on a hot summer's day? Being able to splash about in the water and dig in the sand was great fun (it still is for me). Can you remember the feel of sand as it ran through your fingers and the way it moved and felt as it was pushed from side to side as you tried to make sand castles which always fell down? Or the way it stuck to your skin as you tried to shake the sand off your hands and feet. What did it feel like when the water ran between your toes and rushed out again or when the waves washed over you and sometimes knocked you down? You learnt so much about the beach by just becoming part of the experience and letting your curiosity, excitement and wonder take over. What wonderful learning experiences they were.

Young learners find out about their world in exactly the same way you learnt about the beach. Using all their senses, children acquire information and make meaning from their observations. They are always exploring and investigating. Once curiosity is aroused,

Using their senses, children acquire information and make meaning for their observations

children will repeat the experience over and over again. Children revel in the consistency of events and observations. They are learning that every time a particular event occurs it is likely that the same thing will happen again in similar circumstances. This helps to establish knowledge which is continually being tested. These young learners are already active scientists who have acquired a lot of scientific knowledge just waiting to be tested, tried, elaborated upon and changed if necessary.

If, as in this view, children are already proficient learners of science we need to take account of all this prior knowledge and experience that children bring with them into the classroom.

Learning science

Research (Driver & Bell 1986; Harlen 1985; Osborne & Freyberg 1985) has acknowledged the importance of prior knowledge and the provision of experiences in facilitating learning in science. The way learning is facilitated in the classroom is dependent upon the following assumptions:

1. Learning is an interpretive process.

Children are constantly interacting with their environment, making observations and acquiring information. In order to make sense of all this information children draw on their existing knowledge to help formulate new ideas or to modify or extend existing ideas. When children encounter an event which arouses their curiosity or challenges the view they hold they may become motivated to investigate further.

2. Learning is an active process.

Children must become actively involved if learning is to occur effectively. Activities must be challenging enough to stimulate interest, and children need to have experience in taking responsibility for their own learning.

3. Learning experiences must be purposeful.

Learning experiences must be purposeful in order to maintain interest and to provide sufficient challenge for children. Experiences must be relevant and contextually-based as children need to be able to relate to events.

4. Learning is dependent on prior knowledge and experience.

As indicated earlier, children bring with them a vast store of information and experience. All children will have their own unique set of

experiences from which to draw. They will be learning at different rates and will acquire different information depending on their prior knowledge and experience.

Much of the learning that takes place before entering school occurs through informal play situations. Play provides the medium through which children are free to explore and engage with ideas without outside direction. Children have opportunities to try out their ideas, solve problems and develop further understanding and knowledge. The value of using play in the classroom to facilitate the learning of science cannot be underestimated.

It stands to reason that, if play has provided opportunities to experience different things and enabled valuable learning to take place before coming to school, it is a necessary ingredient for learning science when children enter the classroom.

The learning environment

An effective learning environment for science in the classroom requires the provision of a variety of experiences which allow children to explore, question, investigate and draw conclusions. These experiences should be learner-centred with the teacher providing opportunities for children to extend their knowledge. In early childhood classrooms, structured and unstructured play experiences are already a part of the daily routine. Children are encouraged to work in groups to facilitate social interaction and activities are planned to allow free exploration and play.

Opportunities for effective learning in the classroom will be dependent on a number of factors. An effective learning environment must be:

1. **Stimulating.**

   A stimulating learning environment provides opportunities for children to explore their world, encourages children to ask questions, challenges existing ideas, promotes creative thinking and problem-solving skills, and invites discussion.

2. **Non-threatening.**

   If children are encouraged to be active participants they need to feel secure about investigating their own ideas and discussing their ideas without fear of being ridiculed.

3. **Challenging in a positive way.**

   When confronted with a challenging problem that engages our interest we tend to respond positively and creatively to solve that problem. Young learners are no different.

4. **Valuing.**

   We need to value each child's contribution and demonstrate this in the way we interact with each child in the class. Accordingly, children should be encouraged to value other children's ideas as well as their own.

5. **Communicative.**

   Communication is vital in the learning process. It helps to clarify and inform. The sharing of ideas requires trust. Children should be encouraged to communicate their ideas freely and in a variety of ways. Oral and written presentations, creative and artistic activities, dramatic and musical interpretations all contribute to the development of this trust.

Free exploration and planned investigation

Learning science in the classroom should be a mixture of free exploration and planned investigation. Children need time to explore and investigate events and materials without the guidance of the teacher. Play activities are an important part of this organisation. Whether undirected or planned, play activities provide opportunities for children to explore different events and ideas.

> *Through free, exploratory play, children learn something about situations, people, attitudes and responses, materials, properties, textures, structures, visual, auditory, and kinesthetic attributes dependent upon the play activity. Through directed play, they are proposed another dimension and a further range of possibilities extending to a relative mastery within that area or activity.* (Moyles 1993, p.20)

It should be pointed out that extended periods of free play can be limiting and narrow the field of reference from which children can explore ideas that emerge. Free play may not be challenging enough, on its own, to promote further science learning. The role of the teacher, therefore, is to enhance the learning process by providing direction and investigations which will motivate and challenge the learner to find out more. The road to learning is a shared experience. Both the teacher and the learner must be involved.

Many of the activities or topics already presented in early childhood classrooms are excellent science learning experiences. They can easily be adapted to enable children to explore and investigate. An experiential approach (Sharp & Griffin 1994) allows children opportunities for free exploration along with planned investigations.

An experiential approach focuses on the need for children to be given a wide variety of experiences which they can draw upon. The emphasis on many different experiences is most appropriate for young learners who need a variety of stimuli to facilitate the development of ideas and broaden the range of information which they can call on when they meet new situations.

> *Successful experiences are ones which children find tantalising or stimulating, and which hold out a promise of a satisfying revelation, the acquisition of a useful skill, or the construction of something of which children can be proud…a successful experience is characterised by sustained activity towards a goal, lateral thinking and cooperative interaction.* (Barker 1991, p.5)

The following examples demonstrate how topics or activities can be extended in the classroom to provide valuable science learning experiences. These are by no means the only areas which could be covered. They are presented here to show how easy it is to include science in the classroom within a context of play.

Sand and water play

Sand and water play activities can occur in every classroom. Children are able to play freely with the materials and through this, develop social play skills, maths and language skills and manipulative skills. They are also important opportunities for exciting science learning as well. Exploration enables children to find out about the properties and behaviour of these materials. Think back to the example at the beach. What happened at the beach can

happen in the classroom. Children can be encouraged to ask questions, try out ideas, make observations and share what they have found out. Children will need time to play with the sand or water in order to make these observations.

Modifying the variety of materials and quantity of resources available to use or asking questions can provide challenging situations which will motivate children to investigate further. Questions such as:

- Are all the sand grains the same size/ colour?;
- What is a good recipe for building sandcastles?;
- Does water always flow in a long stream?; and
- How long does it take for your hands to dry?

can stimulate lots of investigation and ideas.

Wind-up toys

Wind-up toys are common in the classroom. Children are familiar with them and there are many kinds of toys available. Where is the science? Activities can be included which will lead to lots of science learning. In early childhood classrooms, emphasis on learning science should be on the acquisition of skills and processes rather than on vast amounts of content. Using wind-up toys can provide plenty of opportunities to develop these skills.

Have you ever taken notice of how one of these toys move once it is wound up? Ask children to describe the way the toy moves. By doing this activity in groups children gain skill in making observations, inferring why it moves the way it does, communicating and sharing ideas, reporting back what they have found out, and being able to work cooperatively. Once motivated, children start asking their own questions, and will come up with investigative questions you did not even think about.

Strong and sturdy

The stability and strength of structures are important science concepts. Children are often building things and playing with construction kits in the classroom. These activities can be extended by challenging children to design and implement tests to find out information.

Children can explore stability and strength by using plasticine balls and toothpicks to build structures. Once they have had time to play with the materials, questions such as: *Which is the tallest/strongest/weakest structure you can make?* or, *What happens when you vary the number of plasticine balls at the base or the top?* can stimulate further ideas to try out.

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Down the ramp

Children will often make up their own rules and games. Playing games can be used to facilitate learning in science by utilising the way children decide what to do, what materials to use, and how the game will be played.

Investigating incline planes and machines can be developed by using these ideas. To find out which object moves down a ramp the best, the fastest or the slowest children can design their own tests to investigate. They will have to decide on the 'rules'—how the test is to be conducted, what they are trying to find out, how many times they will run the test and how they will record their information. Being able to conduct and carry out reliable tests is an important skill and an exciting process which can lead to some very creative investigations.

How do wind-up toys move?

Bubble magic

Most people love blowing bubbles—an experience which can also lead to some very exciting science learning. Blowing bubbles on its own does not mean a great deal, but if you watch children playing with the equipment they will, after a while, start to initiate their own investigations. They invent their own games and try out ideas. They may try to catch their bubble, or blow the biggest bubble, or see how long their bubble can float before bursting. They do not need any prompting or direction to play around with the material and to acquire information.

Are bubbles always round?

Once children have been able to play with the bubble mixture and blow bubbles for a while a question like this can be very stimulating.

It can lead to lots of ideas and discussion which in turn can lead to some interesting investigations. Allowing children to suggest ways of testing their ideas facilitates the valuing of their ideas as well as the development of skills and knowledge.

Missed opportunities

While the previous examples could be identified easily with some aspects of science, there are many so called '*missed opportunities*' which are overlooked by the classroom teacher and which hold great possibilities for learning science. Missed opportunities refers to those classroom activities that occur on a daily basis—news, show and tell, weather reports, colour days, gross motor activities, and painting and drawing to name just a few. These activities can be valuable learning episodes once awareness is raised as to their potential.

Teachers can promote the learning opportunities by asking questions about

different events, by responding to children's comments and allowing time to discuss these further. Detailed observations of objects and events can be encouraged and there are many opportunities where teachers can take advantage of situations that arise to allow children time to consider and investigate new ideas.

Conclusion

The intent of this chapter was to raise awareness of the nature of science and the way play can contribute to learning in science in the classroom. We need to keep reminding ourselves of the child on the beach and the enjoyment and excitement that has been generated. We must try to transfer that same feeling into the classroom and there is no better place to start than with young learners. We don't take enough advantage of the opportunities open to us. The value of play in learning science cannot be dismissed. What children bring with them to any situation must also be valued and cherished. In the words of Elstgeest (1995, p.10):

> *It may be the clouds in the sky, or the birds in the undergrowth; it may be a bumblebee on the clover, or a spider in a web, the pollen of a flower, or the ripples in a pond. It may be the softness of a fleece, the 'bang!!' in a drum or the rainbow in a soapfilm. From all around comes the invitation; all around sounds the challenge. The question is there, the answer lies hidden, and the child has the key.*

Children investigate bubbles by blowing the biggest and longest

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Chapter 5

Playing around with technology: Children creating multiple learning pathways

Marilyn Fleer, Marita Corra and Wendy Newman

Introduction

A group of young children are assembled on the carpet area in a childcare centre. It is free-choice time and they are busy organising their dramatic play. Their teacher is close by and tunes in to their conversation. The focus of their play is a bus.

'We need bus tickets' (Andrew, 4 yrs)

'And money' (Teddy, 4 yrs)

'How could we make the money?' (Teacher)

'We could use the money stamps and cut them out' (Teddy, 4 yrs)

'The bus doesn't have any wheels!' (Claire, 3 yrs)

'We could make some' (Teddy, 4 yrs)

'How?' (Teacher)

'Box construction' (Alyse, 5 yrs)

'Rubbish lids' (Antony, 4 yrs)

'Milk bottle tops' (Claire, 3 yrs)

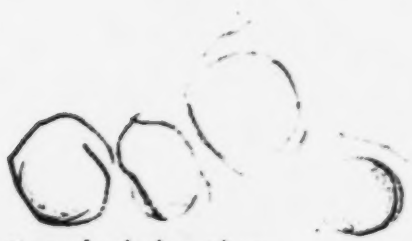
'How many?' (Teacher)

[Children call out a variety of numbers]

'Two on one side and two on the other. That's four.' (Teddy, 4 yrs)

'Should we have any rules for children playing on the bus?' (Teacher)

'No pushing' (Joshua, 2 yrs)



Money for the bus tickets

'Three children at a time, 'cause there's three chairs' (Teddy)

Some general discussion about bus stops follows.

'...Let's get to work' (Teacher)

'I want to go and draw a picture for the bus' (Alyse, 5 yrs)

'I want to do box construction' (Andrew, 4 yrs)

'I want to make the wheels' (Claire, 3 yrs)

Later, Alyse gave me (Wendy) a carefully drawn picture of a bus attached to a fringed frame. Andrew presented me with a painted box with a slit cut into it. 'It's for the tickets,' he told me. Claire carefully cut out four paper wheels for the bus and then set to work making some money (shown below).

This play scenario demonstrates the power of play in children's technological development. In the first section, it is evident that play provided the vehicle for Wendy, the teacher, to find out about her children's technological thinking. She could move into her children's world and learn from them how they planned, how they constructed, and how they appraised their own imaginative play. In short, she could develop a profile of each child's technological capability in an unobtrusive and realistic way. It was not a test and she did not have to motivate them to perform at their highest level, motivation and engagement already existed. A more accurate profile of those children could be developed because she had moved into their world, rather than moving the children into her world.

Secondly, play provided the context for taking the children's thinking further in ways which built upon their knowledge, experience and interest. The bus role play enabled Wendy

to utilise existing play rather than having to stimulate a play situation. The children's play was enriched by Wendy's suggestions… 'Let's get to work!'

Spontaneous play contexts such as the sociodramatic play with the bus occur regularly in very young children's lives. Preschools and childcare centres are organised to provide spaces (physical as well as time) for children to engage in play. However, a school environment and the general ethos of learning in schools is generally less play-friendly. There is also the view that older children, who are entering a developmental period in which rules predominate, require different learning contexts. This belief generally manifests itself into organised learning experiences where the focus is on one pathway— that which is set by the teacher. These types of structured experiences usually do not allow for multiple pathways, particularly those generated by children through play.

This chapter provides some insight into how multiple pathways for learning in technology can be created for children. Two scenarios which focus on technological outcomes for children as detailed in the *Technology Profile and Statement* are presented. The emphasis of this chapter is on how play provides a vehicle for:

- ascertaining children's technological levels; and
- allowing children to create their own learning pathways in technology.

Technological learning

When people talk about technology they tend to think of high technology such as computers, microwave ovens and robots. Whilst these are certainly technological artefacts, technology embraces much more than this. Simple technologies such as a paper clip, traditional technologies like digging sticks or life support technologies, for example, a baby bottle, are all technological artefacts.

The National Statement on Technology (Curriculum Corporation 1994) considers the processes which brought about the creation of the artefact. For example, in the production process, people design, construct and evaluate artefacts. Similarly, people utilise systems, processes and materials as they plan, make and appraise.

In the school context, technology education involves the designing, making and appraising of materials, systems and information (Curriculum Corporation 1994). The design, make and appraise process can best be represented as a circle, since children act technologically when they make something, appraise the result and then draw a design of their creation. Similarly, children can manipulate materials, such as clay, find out about its properties and then design and make an object. Children can also appraise a system, such as fruit time and decide upon a new system, trialling it and fine tuning it before adopting it into their normal routine. This process view of technology is much broader than thinking of recently invented technological artefacts.

The challenge facing educationalists is how to introduce this new key learning area to children in ways which are meaningful and relevant to their lives. The real world of the child is complex and ever changing. There are many ways in which children learn. The introduction of technology education should build upon this complexity by utilising a multitude of pathways for learning. Play provides a powerful pedagogical tool for achieving this.

Building multiple learning pathways through play

The assumptions inherent in this chapter are, firstly, that children learn best when they have some input into their technological learning environment, and secondly, when children play they bring to the learning environment their

existing technological knowledge, experience, and skills which are all culturally situated. Vygotsky has argued that:

> *Where there is an imaginary situation in play, there are rules—not rules that are formulated in advance and change during the course of the game but ones that stem from an imaginary situation. Therefore, the notion that a child can behave in an imaginary situation without rules is simply inaccurate.* (Vygotsky 1978, p.95)

There is a significant amount of evidence which indicates that children's actions are indeed culturally bound. The bus role play is an example of children acting out a situation that is culturally familiar to them. The imaginary technological situation is indeed framed within their experiences—or in Vygotskian terms, their play is governed by the rules, in the above example, the rules are about what takes place when you use a bus. While children's play is structured by the rules, they are still able to determine the direction of the play.

There is also a significant body of literature which indicates that children interact with each other and with objects in ways that are stereotypical (or gendered). MacNaughton (1995) has shown how, during free play situations, children take on patterns of behaviour that society reinforces (implicit rules for behaving and interacting). The gendered patterns of behaviour (e.g., boys expecting more teacher time; girls waiting patiently; boys utilising most of the centre space; girls utilising only the home corner) are rules which children take with them to imaginary situations. These rules are not explicitly known by children—hence they are not articulated, challenged or considered metacognitively. In technology education, children are encouraged to think explicitly about process, interactions and materials. With teacher assistance, children can design systems and processes that are not only more culturally appropriate, but gender sensitive. For example, children can evaluate their bus role play from the perspective of who is controlling the bus, money or play. Thereby explicitly considering gender and cultural issues.

Experiences for children become patterns of understanding over time. Children begin to predict and hence feel more control over their lives. As children's experiences increase with age, the notion of rules takes on more meaning. In schools we see these rules being more formalised. Vygotsky has argued:

> *Just as the imaginary situation has to contain rules of behaviour, so every game with rules contains an imaginary situation.* (Vygotsky 1978, p.95)

Children of school age formalise play through the articulation of the rules—in advance of, or as, they play. Consequently, it can be argued that play for older children is just as important, and hence should be built into the school curriculum. Children need opportunities in which they can act out and play with new learning concepts and established learning, particularly in technology education. Play provides the vehicle in which the link between the new and the established can occur. It also sets an everyday framework that is relevant to the lives of children. Hence learning is contextualised within the familiar. This is more than simply integrating learning across the curriculum. It is integrating learning into a play context with which the child is familiar and one in which she/he is in control. Learning then moves beyond the walls of the classroom, as children incorporate their world into their learning experiences.

In the following two play scenarios, play is explicitly utilised for facilitating learning in the key learning area of technology.

Play scenario one: The imagination room

In this scenario Marita outlines what technology means when children play in the imagination room.

In this unit I concentrated on finding out about children's technological knowledge, language and skills. I wanted to know what technological experiences children brought with them to school. As Vygotsky would say, this would give me an insight into their rules!

So I invented the imagination room. This provided a play context. The children had to decide what they wanted to do in the room. They had to plan what they could do, how they would go about it and what materials they needed. These are all technological skills. In order for the whole group to utilise the play space they had to agree to what they would do in the room. This required high order communication and negotiation skills.

Once an idea had been agreed to, the children had to come up with designs and plans of action for creating their room. Here you can see that they needed to design, make and appraise—the process strand of technology. The children had to decide upon the materials they needed and work together to assemble them in ways which met their design requirements—here the materials strand was being featured. Finally, the children played in their room, thus appraising in a most effective way whether or not what they had designed and constructed was satisfactory for their needs.

This was the general process that occurred—as it related to designing, making and appraising…now for the specifics. The children decided to build a fairy room. This is what happened…

The fairy room generated a high level of interest and excitement from the children. The notion of a fairy room quickly expanded to building a fairy house. Building and designing a house is an occurrence that is most relevant to many children. They could explain in detail the requirements of how to build a house and list features which were necessary for a design brief.

Likewise when discussing a fairy house, the children could visualise and describe features necessary in designing and building. Drawing on their own experiences and knowledge, the children were able to have total input into structuring a learning environment. Such input required the children to share existing knowledge, ideas, beliefs and skills. From such sharing sessions group rules and multiple learning pathways emerged.

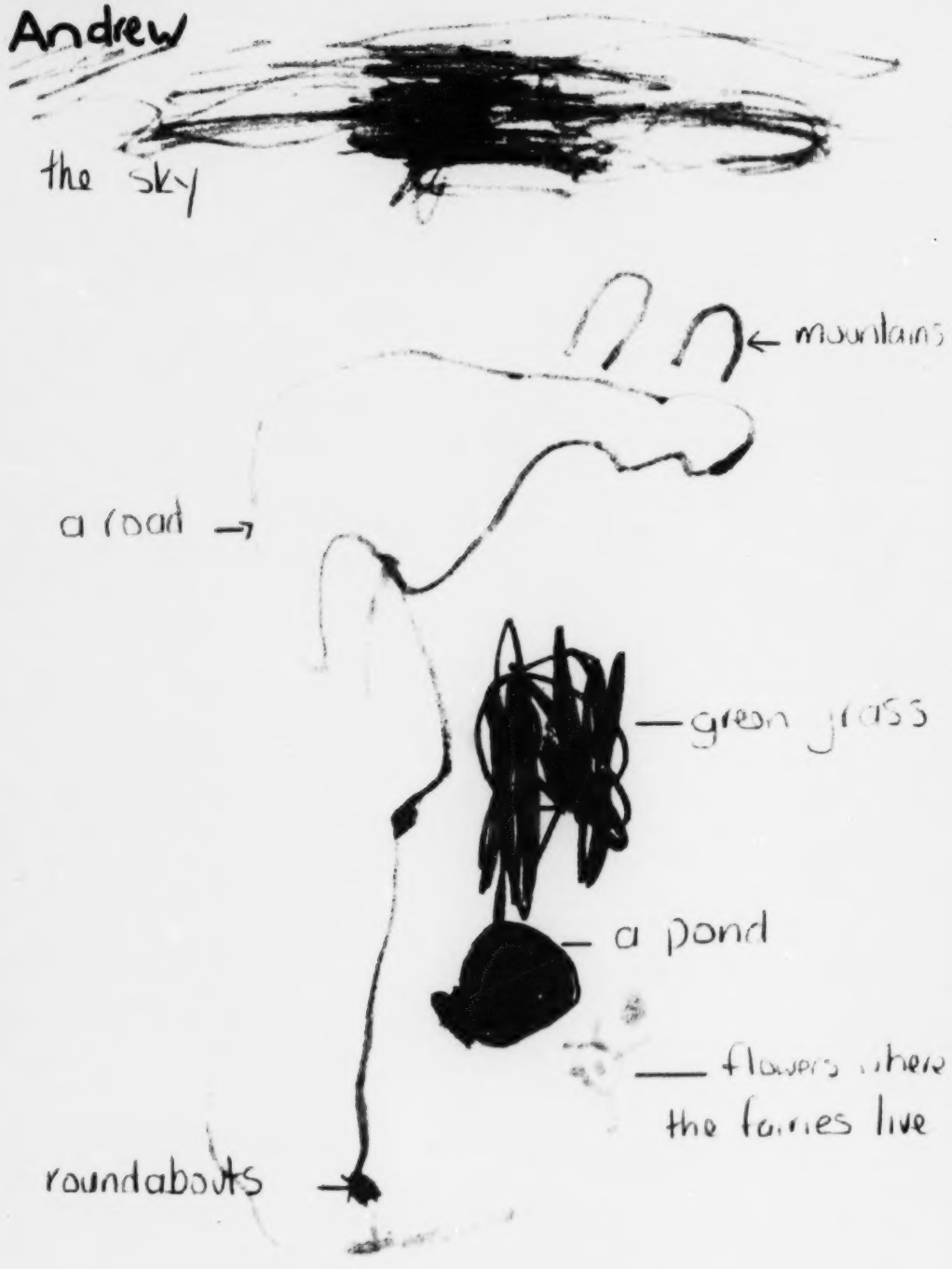
Four separate groups became established in the classroom, each with their own beliefs, understandings and expectations of the fairy room.

Group One:
'Fairies are only tiny, so a fairy house could only be as big as a toothpaste box'
Group Two:
'Fairies don't live inside, they live outside in the garden'
Group Three:
'Fairies are not real, they are only in your imagination'
Group Four:
'This is the fairy house we are going to build'

The first group organised a construction table of boxes, tape, paper, wool, twigs etc. They set about making lots of fairy houses on a miniature scale, complete with windows, doors and some household furniture. When completed, the children placed their fairy houses up on the window sills: 'So the fairies can have light and see the sky' (Jarred).

The second group stuck to their beliefs that fairies live outdoors—under mushrooms and in the flowers. This led the children to prepare a village site under a large pine tree. The children made paths, roads, hills, mountains, roundabouts, wooden structures and even garden beds. This was the site for the fairy houses. The children used toy trucks, spades, bark, grass and dirt to help them with their constructions.

Andrew's plan.



This group worked on their fairy village each outdoor time. Andrew drew a map of how to find the fairy house in the outdoor area.

The children's belief of outdoor homes was strengthened by finding fairy mushrooms (red and white) growing under the trees after heavy rains.

The third group chose not to participate in the project establishing a fairy room or building a fairy house because fairies are not real. Hence there was no interest in participating. Their rights were respected.

The fourth group was comprised of children who had drawn up plans and designs for a large scale fairy house. They pooled and shared their ideas:

'It must have a small door with a little door handle' (Alexa).

'It must have a corridor that takes you to the bedroom' (Helen).

Plans included minor details such as: 'An alarm clock to wake up the fairies' (Ollie) to major structural details of footings: 'We need to put cement here first, so that the house can stand on it' (Tim) and 'The rooms need to be square' (using a set square) (Alexa).

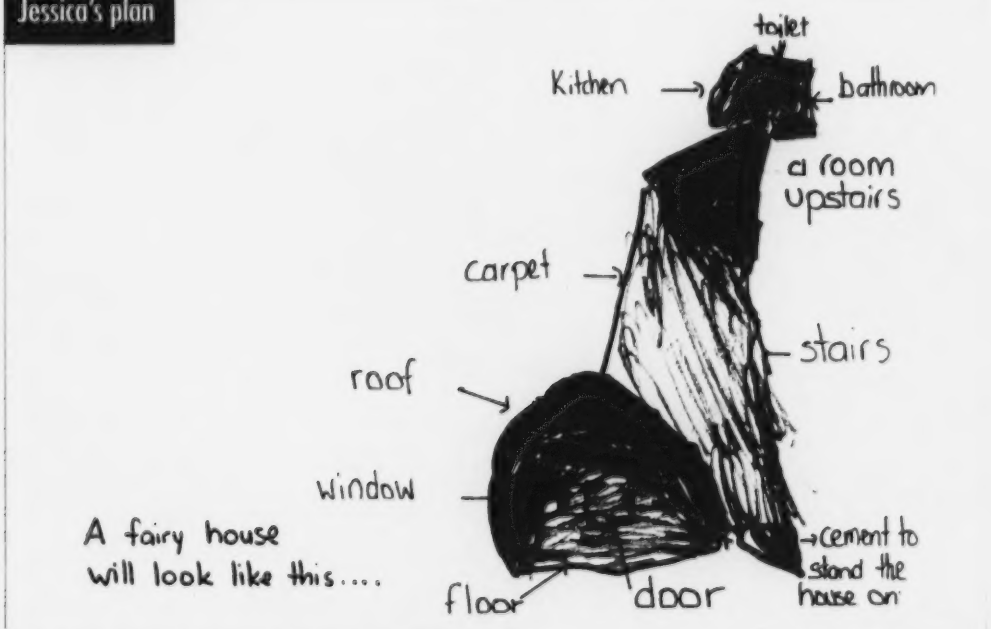
The children drew on their experiences and understandings of building requirements for house designs.

The children's plans included roofs, floors, walls, doors, windows, door handles, stairs, corridors and carpets. The rooms were labelled as kitchen, toilet, bedroom and bathroom. It was interesting to note that some of the children's designs included indoor and outdoor features: 'The flowers grow in the soil outside' (Ollie).

Once armed with plans and designs the children constructed a house using timber blocks, tables, plastic shelves and other suitable materials they could carry into the fairy room. A real team effort!

Through the fairy room, I was able to take children's thoughts, experiences and current knowledge and use play and imagination as a tool to provide children with technological learning. The fairy room provided a magic blend of play and imagination which was linked with modern technology!

Jessica's plan



Marita's fairy room provided many opportunities for children to design, make and appraise with materials. It also provided Marita with a real context in which she could profile her children. This information provided the basis for extending their technological capabilities in ways that were meaningful for the children. In the next play scenario Wendy outlines another way that play can be used to facilitate technological learning for children.

Play scenario two: A friendly creature comes to visit

The second play scenario illustrates how the box construction area can be utilised to explicitly generate technological activity, following a design, make and appraise approach. Wendy outlines what she did with her Year 1 children:

Like many preschool rooms, our box construction table is a very popular place. The majority of the time it operates as a free choice table. However, at other times I organise a 'challenge day' for the children.

When we have a challenge day, the task is focused. For example, I once gave the children a matchbox car each, and set them a challenge: design a bridge strong enough to support the car. In this example, very few pathways for learning are present. Whilst different ways of constructing may arise, the direction of the activity is defined by the problem I set the children, rather than problems that are generated by the children. Imagination in this example was not fully explored. As a result, I prefer to encourage my class to construct their own pathways for learning.

To accomplish this, I used an imaginary situation. I took a covered picnic basket into school one day describing to the children that it contained a shy and lonely creature. The children eagerly agreed to make it a friend to keep it company. The children all tackled the task in unique and interesting ways. A few children managed to follow the process of designing, making and appraising. Others had grand ideas but lacked the skills to complete the task. The exercise gave us a very clear understanding of where each child was at with regard to their technological development.

We followed up the initial experience with activities planned for individual children. For example, we taught one child how to use pipe cleaners effectively and allowed another child time to experiment with aluminium foil. We compared the strength of different materials (including paper, cardboard, plastic, wood, etc.) and discussed the advantages and disadvantages involved in attaching them together.

On subsequent days, we utilised the children's constructions to develop a community of friendly creatures. Each morning I told a story (one I created to suit the particular creatures that the children had constructed) and invited individuals to share with the group other story lines—that is, the children made their creatures talk and helped develop the story. This of course stimulated further technological activity. For example, Melinda's creature indicated that it was homeless and wanted somewhere to live. A range of designs were produced for Melinda's creature to consider. This led to a complex discussion about design briefs and architectural plans. This unit just went on and on!

The learning for the children was contextualised, relevant to their experiences and specific to individuals. We had accomplished what we set out to do. Firstly, we provided a play environment which encouraged multiple learning pathways and secondly we had provided a setting in which we could ascertain children's technological levels. The unit was successful—both parents and staff commented about the children's enthusiasm towards their work. The children talked about the lonely creature who came to visit for months after the unit was completed and may still be discussing it!

Since that time, I regularly organise opportunities for imaginary play in which children can plan, make and appraise with materials. Some things I have done, sparked by the children's interest, are:

- mechanic's workshop;
- bakery; and
- toy shop.

Conclusion

In technology education, teachers work together with children to find out what their rules are—they profile their understandings within the context of their experiences. Teachers then make explicit through play, the rules of technology education—that is, how to utilise the process skills of design, make and appraise with materials, information and systems. This provides another way of thinking and acting as they play. Development within technology for young children occurs when the covert rules become overt. Vygotsky has argued that:

> *...at the beginning every imaginary situation contains rules in a concealed form....* (Vygotsky 1978, pp.95–96)

The two play scenarios detailed in this chapter provide examples of how play can be utilised to make the *rules* (in Vygotskian terms) of technology education explicit to children so that they have access to another way of thinking. As with the development of play, once the covert rules of technology are explicit, it is possible to utilise them more effectively. However, when the overt rules of technology are established it is important for the teacher to ensure that the imaginary situation in technology is not concealed from children. Vygotsky has also stated:

> *...that every game with rules contains an imaginary situation in a concealed form.* (Vygotsky 1978, pp.95–96)

The focus in schools has generally been only on making the rules explicit—the imaginary situation has not been fostered. Clearly if technological development is to take place imagination must also be featured. Vygotsky has argued that:

> *The development from games with an overt imaginary situation and covert rules to games with overt rules and a covert imaginary situation outlines the evolution of children's play.* (Vygotsky 1978, pp.95–96)

We would argue that the covertness of imagination in games played by older children in schools and the learning contexts created by teachers, have been constructed too rigidly. Space and time should be made available so that children can enter into play scenarios where learning pathways are defined in terms of children. Teachers set the learning framework (but within a broader understanding of gendered interactional patterns and necessary intervention), but children direct the learning pathway. Play provides an avenue for children to have input into creating the teaching-learning context. The play scenarios detailed in this chapter highlight how, within the learning agenda set by the teacher, children can create the pathway for learning which best suits their needs.

Specialists in early childhood education can learn from each other. Teachers in the first years of school can look at preschool and child care settings for ideas on how to set up play situations. Teachers in preschool and child care can gain from the first years of school curricula ideas on the rules that should be made explicit to children. However, we can all learn about appropriate pedagogy when we look at children at play. When we enter their world, we gain understandings about how children think, interact and learn. Creating a play-friendly environment is one step towards this occurring.

Fairies don't live inside, they live outside in the garden!

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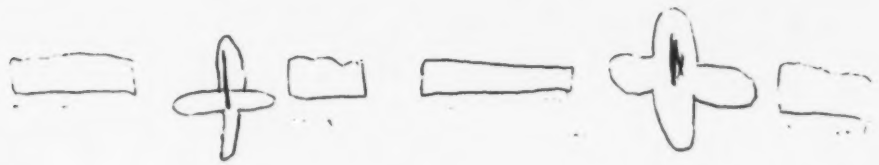
Chapter 6

Play and the mathematics profile



Penny Skinner

Play is children's natural and most powerful mode of learning and socialising, so it should feature prominently in our educational provision for them. There is a strong relationship between play and mathematical learning. Mathematics offers a great deal of diversity that can enrich children's play in early childhood settings. Play provides a context for much mathematical learning, particularly when children play together, spontaneously making comparisons, classifying objects, posing problems, constructing models, making pictures, and exploring possibilities.

One Friday afternoon I greeted 60 five- and six-year-olds at the door of their building. When the children saw me there they asked excitedly if we were going to be doing maths. When I said, 'Well, this afternoon we're having play', many of them grizzled, 'Ohh'. Then Ashleigh said excitedly, 'Well that's maths!'

Mathematics is the study and explanation of patterns and relationships. Patterns and relationships are at the core of working with numbers and solving problems and puzzles, and they are fundamental to the beat of a song, the taste of a chocolate cake, the success of a work of art. We should view children as growing mathematicians. Mathematicians are excited by patterns, they are questioning, creative and collaborative. They do not simply learn mathematical techniques, they generate them and use them. And they play; they play with ideas, with materials and with language.

There are two broad areas of *play* provision which need to be considered: spontaneous play and structured play. Spontaneous play is a child's own response to play materials or situations (either structured or unstructured situations), while structured play involves following specific directions. Spontaneous play is vitally important; it reveals children's understandings and misconceptions, allows children to explore ideas and materials in ways that adults may not have considered, and gives children the opportunity to follow their interests and achieve success. Structured play can be based on specific problems or concepts and it can often build on what children do spontaneously.

This chapter highlights how play can form an integral part of mathematics learning in the early years of school.

A framework for mathematical learning through play

To maximise children's mathematical learning, teachers can do three things:

1. create *a rich mathematical play setting;*
2. compile a *profile* of each child as a growing mathematician; and
3. *intervene in children's play* to help them progress along a continuum of mathematical understanding, knowledge and skills.

This is in contrast to the approach to mathematics teaching and learning that involves the provision of sequences of structured demonstrations and activities that aim to build specific concepts and skills. By building a profile of each child which details their progress as a mathematician at play, and meeting their needs as disclosed by the profiling, teachers do not need to resort to the teacher-directed demonstration/activity approach which limits mathematical development. In this way profiling supports and enhances learning based in play.

1. A rich mathematical setting

A rich mathematical learning environment enables children to investigate playfully a range of understandings, materials, concepts and skills, and to communicate mathematically with others. We need to make accessible and readily available a wide range of structured and unstructured materials to engage children in play and stimulate their thinking.

In my school's early childhood classrooms, the children choose from a range of structured materials such as pattern blocks and measuring implements and a variety of unstructured bits and pieces, and games. The rooms also have models, posters, children's literature, art supplies, blank booklets, musical instruments, written problems and questions, visual problems, collections, and children's work on display. The children usually select their own materials and play spontaneously with them.

A truly rich mathematical setting takes into consideration the architecture and fittings of the learning environment.

Our rooms have small square windows at floor level which capture the children's attention. Matthew compared the sunlit shapes (parallelograms) cast by the window at different times of the day, tracing them on large sheets of paper. Several children attempted covering the windows with various materials such as blocks to 'measure' the area of glass. Jake used popsticks and counters to replicate the complex pattern of the classroom carpet. Kristen used blocks to compare the length and width of a tabletop.

The mathematical setting also includes the human resources in the classroom, amongst whom the teacher is the key person. Ideally, teachers should model enthusiasm for mathematics and should be learners of mathematics themselves. The more mathematics teachers know or inquire about, the more richly they can provide for children's mathematical learning. All adults should participate in play. By taking the cue from children or initiating play to extend children's experiences, adults can develop new dimensions to understandings and relationships.

Mathematics is the study and explanation of patterns and relationships

The children in two of our classes were engrossed with the book, *The Lighthouse Keeper's Lunch*, making lifesize models of Mr and Mrs Grinling, and rigging up a pulley system between large replicas of the lighthouse and cottage. With the idea of introducing the concept of tens and ones to the children, I posed anonymously as Mr Grinling, writing a series of letters. The first one was as follows.

'Dear children,

it is my birthday soon.

Guess how old I will be!

Love from Mr Grinling.'

The second letter continued the focus.

'Dear children,

have you guessed how old I am yet?

Here is your first clue.

I am older than this:

Love from Mr Grinling.'

Each subsequent letter enclosed a further clue, so the children found that Mr Grinling was older than 20, then 30, 40, and 50.

Then Mrs Grinling wrote a letter to the children with the final clue that Mr Grinling was then (just before his birthday) 54 years old.

When Mr Grinling's birthday arrived, we celebrated with five large cakes, each bearing ten candles, and five cupcakes, each with one candle.

These examples highlight the rich mathematical settings that can be created through play.

Creating rich mathematical settings through play

2. A profile of each child

We should build a profile of each child's mathematical development. It can be comprised of anecdotal records of the child at play, a record of the child's developing concepts, skills and understandings, transcriptions of the child's language, work samples, and photographs of the child at play. The Mathematics Profile (Curriculum Corporation 1994) offers a structure for individual student profiles and a continuum of concepts, skills and knowledge along which each child's progress can be monitored. The pointers should be discarded as they narrow the potential of the outcomes. The strand organisers and outcomes can be interpreted widely and in developmentally appropriate ways, while the pointers limit them.

We need to examine the Mathematics Profile critically to assess whether, as it progresses through the levels, it reveals the child as a growing mathematician. There are some learning outcomes which are useful indicators, and, at some levels, there is a strand devoted to working mathematically. But, there does not seem to be a central commitment to the child as a mathematician, displaying curiosity, working enthusiastically, creatively and collaboratively to play with ideas, materials and language, and to generate and use mathematical techniques. We should extend the strand *Working Mathematically* to encompass these important mathematical characteristics.

3. When adults intervene in children's mathematical play

When adults intervene in children's mathematical play, they can be guided by what the profile of the child reveals about their understandings and needs. Intervention can take the form of providing additional materials and engaging children in conversation to challenge their thinking and use of language.

Steven was constructing cubes and tetrahedrons from square and triangular interlocking shapes. Another child, Michael, was sitting with him but they were not talking. I wanted to challenge Steven to talk about what he was doing, and think about his use of mathematical terms, an aspect of mathematics in which he was showing some development at the time.

'What do you call this shape?' I asked, picking up a cube.

'A square', replied Steven

I picked up a square block. 'What do you call this one?'

'A square.'

I put them side by side. 'So this one's a square and this one is too. Can they both be squares?'

'Well that's a box square...that's a box. Ask me another one.'

I picked up a tetrahedron. 'What's this?'

Michael was interested. 'A triangle box,' he said.

Steven responded with, 'No it's not, it's one of those olden day things that they used to build in the sand.'

'A pyramid?' I asked.

'Yes!'

Adults can intervene, too, to divert children from destructive or pointless play. The diversion can be closely related to the children's actual play, and it can also be used to introduce new mathematical ideas to the children.

Some children were building haphazard piles of blocks and knocking them down loudly. I sat alongside them on the floor and silently began to sort through a container of plastic animals, putting them in identical pairs to form a long queue. The children stopped what they were doing and joined in my play. I told them the story of Noah's Ark and they suggested using the blocks to build an ark for the plastic animals. Later they made a large drawing of the ark and drew pairs of animals on board. They used their drawing to share the story with the other children in the class. Some days later I used the story of the ark to introduce the concept of even numbers to the children. (The children called them Noah's Ark numbers, not even numbers.)

Mathew was building a pile of blocks underneath a table. 'I'm going to blow up the table, 3, 2, 1 boom!', he told me. To divert Mathew from his destructive play, I said, 'When you counted backwards it was like a spaceship blasting off.' Mathew responded, 'I can make a spaceship' and he began to do so. Later I helped him count backwards from 10. He followed up this play by painting a large spaceship and I helped him write the numbers from 0 to 10 on cards to place on display beside his painting.

How do we know what play experiences to provide to develop children's mathematical learning?

Generally, we can provide opportunities for children to play with materials, to play with ideas and problems, to play with language and to play games. We can draw on what we know about mathematics and what we know about how children learn to determine what materials, ideas, problems, and games to provide. The Mathematics Profile's strand organisers also provide a useful structure for drawing out and applying our knowledge of mathematics. Another rich source of play ideas are the children themselves.

What do we know about mathematics?

We know that mathematics is the study and explanation of patterns and relationships. Thinking of mathematics in these terms provides us with a source of potential learning opportunities. There is an enormous range of possible materials for pattern work, from natural materials like leaves to commercially available materials, and relationships can be explored with readily available items such as plastic bottle tops (which one holds the most water?), elastic bands (which elastic band stretches the furthest?) and toy vehicles (which one travels the furthest when let go at the top of a ramp?). Such materials invite investigation, encourage mathematical talk, and provide opportunities for children to explore their ideas.

There is an enormous range of mathematical materials to develop learning

Posing and solving problems

Mathematics involves posing and solving problems. Problems can initiate play and vice versa. Problems could include: Can you build a chair for a teddy using only paper and sticky tape? (Or three chairs for 'the three bears'?) or story problems which can be solved by role play or model-making. A problem-making play centre can stimulate children to pose problems for others to solve. Problems generated by children are more likely to be relevant and meaningful to the children as a whole.

Five-year-old Stefanie drew and dictated the following problem to make a book titled 'Rabbits'. '5 rabbits eating carrots. 4 rabbits coming back home. 1 rabbit sleeping in his bed. 2 rabbits eating breakfast. How many rabbits is that?'

Xina, also five, made a birthday card for Mr Grinling. She drew a present and wrote, 'Do you know what is in this present? If you want to know you have to turn the page.' On the back of the card she drew and wrote, '1 birthday card, 2 teddies, 3 lollies. How many things is that?'

Another five-year-old, David, made a book after a visit to a playground which went like this: 'Three people sat on one end of the seesaw. Two people sat at the other end. Which end went down?'

Hayley, aged four, drew a red line curving round and round a piece of paper. Then she drew a similar orange line. She asked a friend to help her write, 'Which line is biggest?'

Computation

We know there are four basic operations in computation, and children need to explore each of them widely. For instance, subtraction is often presented as taking away one number from another, whereas it is a more complex concept than this. Subtraction is also concerned with finding the difference between numbers and adding on to make up a deficiency. To ensure children develop a full understanding of subtraction we can incorporate into their play games or story problems that involve finding differences and making up deficiencies.

'The difference game' is a game created by a pair of children exploring the idea of finding differences. It is a game for two players, each of them throwing a die, and the child with the larger number on their die wins the difference (in counters). The first player to collect 10 (or 20) counters is the winner.

There are two division concepts which children need to understand. Take this expression, '8/4'. It can be read as, '8 shared between 4' or '8 how many 4s?' The importance of this distinction is clearer if we look at the problem of what is a half divided by a quarter; if it is interpreted as 'a half, how many quarters?' it makes more sense and can be solved concretely. It is vital in the early school years to help children understand the complexities of the operations.

Five-year-old Craig, playing in the home play centre, set a table with three plates and put 10 orange blocks in a bowl in the centre of the table. He called the blocks 'carrots' and started sharing them between the three plates. When he realised there would be one left over he put it away, replaced nine blocks in the bowl again and shared them again between the three plates.

Laura, also five, wrote a problem book which went like this: 'There were some teddies in the bed. Just their feet were peeping out. (An accompanying illustration shows ten feet.) How many teddies were there?'

Posing and solving problems

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Measurement

There are many areas of measurement for children to explore including length, mass, area, capacity, volume, depth, height, width, gradient, perimeter, circumference, diameter, speed, time and temperature. Measuring implements can be added to dramatic play centres, and specific play centres based on measurement can be provided.

Several wide containers, each containing some water, were placed on a table, along with some small plastic figures of people, and plastic measuring sticks marked in centimetres. A group of five- and six-year-olds began playing by dipping their fingers into the water and making some comments about the comparative depths. Pretending the containers were swimming pools and the figures were swimmers generated some more comparative language. The measuring sticks interested the children too, and they began to compare depths by measuring.

Spatial knowledge

Spatial concepts are an important area of mathematical exploration for children. Freedom to explore visual art and construction activities can involve the exploration of space through play. Play centres can be provided to promote activities such as painting patterns, making collages and constructing. Children can direct how the materials will be used in their play.

Julia made a bird of her own design from squares of coloured paper, then taught others how to make a similar bird. As she demonstrated, she used a range of mathematical language. 'First you get a square and fold in each corner to make a triangle. That's the body. Then you get a square and fold each corner right into the middle, and that makes the head, it's a smaller square. Then you cut out a tiny triangle for the beak…'

Drawing on the Mathematics Profile

We can turn to the Mathematics Profile outcomes for ideas. For instance, at Level 1 there is the outcome: uses numbers to represent patterns (Curriculum Corporation 1994). We can add to collections of pattern materials some cards with numbers on them to see how children use them or we can supply plastic numerals, and we can supply lots of blank cards and writing implements to see how children use these.

There is: uses a calculator to represent and explore numbers (Curriculum Corporation 1994) so we can create a calculator play centre, with calculators (with a constant function), paper and pencils, Lego number and symbol tiles and boards. At the play centre children can explore freely and demonstrate their level of understanding and skills. Calculators can also be added to the dramatic play materials.

At Level 2 children are expected to: begin to read familiar clocks (Curriculum Corporation 1994). A clock factory play centre can be created, with old clocks and watches (analog and digital) to explore, boxes (one a grandfather clock size), sheets of cardboard (some round),

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paper plates, split pins, strips of card, textas, ribbon and glue (good for making model watches). Clocks and watches can be added to the dramatic play materials.

Another expectation is that children: pay attention to order in reading and making informal maps (Curriculum Corporation 1994). A map making centre can be established, with materials for making models (miniature trees, buildings, mountains etc.), boxes etc., to construct objects, maps to explore, and map drawing materials. Maps can be included with the dramatic play materials. Children can create their own maps and develop stories, plays, and games as extensions of their play with maps.

Drawing on children's ideas

As children play, they produce ideas and language that adults can use as starting points for further play. This is the most exciting source of play ideas. The child who says, *I'm going to build a tower as tall as me*, and the one who says, *I'm going to fold the smallest triangle in the world*, enthuse their peers and generate engrossing mathematical activity.

When one five-year-old at our school created a 'Plus Book' filled with addition number sentences, many of the other children did the same. When another began exploring addition of hundreds, others soon followed suit. When Mathew drew a plan for a beach house on stilts and tried to construct it from cuisenaire rods, he encountered problems in constructing the floor and the peaked roof, and a group of other children worked on solving the problems with him. When a group of children created a model of a story map and turned it into a game, others were keen to join in.

These examples demonstrate the power of play to engage children in mathematical learning. Using the Mathematics Profile to plot children's progress as they play makes that progress clear and validates play as the major means of learning in the early childhood years.

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Chapter 7

Play and the language profiles and scales

Laurie Makin

In this chapter, implications of attempting to integrate the notion of profiling student development with basic principles of early childhood pedagogy are explored. The focus is on combining use of the Language Profiles and Scales (English, LOTE and ESL) with the early childhood emphasis upon play as a learning strategy. It is suggested that this can assist early childhood educators to gain the information which is needed to help children become confident, competent users of their languages. It is suggested that, for this to happen, a whole centre/school approach to children's development of all their languages is essential.

Introduction

The notion of profiling children's development raises questions for all those who are involved in children's early education—staff working in early childhood services for children before the start of formal schooling and teachers in the first years of school. Some of the questions to be considered are whether Profiles developed for use in schools can be usefully applied in early childhood services, whether the Profiles can be used in conjunction with established early childhood educational principles such as the importance of play as a learning strategy, and whether play can provide exemplar assessment activities in the early school years.

Two Profiles—English and LOTE (Languages other than English) and two sets of ESL (English as a Second Language) Scales are

Focusing on language profiles through play

currently in use in Australia. They were developed separately from each other and differ in certain critical areas, for example, in their view of the relationship between language (English as a Second Language) development and development in the other key learning areas; and their view of the relationship between first language development and the learning of a new language or languages in educational contexts designed for young children. Nevertheless, they offer early childhood educators assistance in identifying and focusing upon many important areas of language development.

Language is central to all learning. It usually functions like a glass window on communicating or on learning something new such as how to use a new software program or how to bake a souffle. We are only vaguely aware of it because our focus is elsewhere. This is what happens when we are learning *through* language. At other times, language can be an object of attention in its own right. This is the case when we are consciously learning a new language or focusing upon certain aspects of a language, such as making sure that the final draft of a report has standard grammar and spelling, or that we are using accepted conventions in writing a business letter. This second level of consciousness—in which we are aware of language in its own right as a concept which can be examined, discussed, and reflected upon—implies a necessity for the development of metalinguistic awareness.

Some children speak only one language at home. This language may or may not be the language used in the mainstream classroom. If it is not, these children are routinely using two (or more languages) each day once they begin preschool or school education. It is not surprising that there is research evidence (see, for example, Cummins 1980; Harley 1994) of increased metalinguistic awareness in bilingual children if certain conditions of functionality and level of development are met. An example of such metalinguistic awareness is evident in the following text recorded in a kindergarten classroom as five-year-old children played together and chatted informally. A child who had just left the group farewelled them with the word '*ciao*'. This caught the attention of one of the children:

Child One: 'Ciao'. Kevin, does your mum and dad say 'ciao'? It says goodbye. It' s Italian. I don't speak Italian. What do you speak?

Child Two: German.

Child One: You speak Germany?

Child Two: German

(Makin, Campbell & Jones Diaz 1995, p.84)

These five-year-olds are already aware that different languages exist and that these languages have names which are different from place names, i.e., *German* versus *Germany*. They know that different people speak different languages and that different words belong to different languages. They can reflect upon their own and their families language experiences. Multilingual settings can offer, in a naturally interactive context, many learning experiences denied to children in monolingual settings.

Some children (both native speakers of English and speakers of languages other than English) learn another language as a school subject. Staff in increasingly diverse early childhood services and teachers in mainstream classes, in LOTE classes, and in ESL classes are trying to meet the needs of all of these children, to plan appropriately for them, to assess their progress, to report progress, to identify areas of need, and then to begin the planning cycle again.

Organisation

This chapter is divided into three sections within which the profiling of children's languages is discussed in terms of some of the implications for observation and assessment. The sections are:

1. *Child-oriented profiling.*
   The need to focus upon children, rather than upon subject-discrete key learning areas. For a child, particularly a child whose first language is a language other than English, the home language, mainstream English, and English as a second language are all integral parts of the everyday environment. Early childhood services and schools need to recognise this indivisibility of experience and develop whole centre/school responses so that each child's educational environment has coherence and unity;

2. *Communication-based assessment.*
   The notion that communicative needs and intent drive language and must be paramount in any assessment of progress in language development; and

3. *Teacher Talk.*
   If communication is paramount, then assessment of a child's communicative competence cannot be divorced from the communicative competence of the teachers who are involved in assessment procedures, and the ongoing process of profiling must include teacher self-study (including, perhaps, teacher Profiles!).

Section 1: Child-orientated profiling

For each individual, the old adage, *the limits of my language are the limits of my world*, is true. This statement fits comfortably with Vygotsky's notion (1978) that any idea begins in social action between individuals. Certain implications arise for teachers using the language profiles and scales when a social interactionist perspective is adopted.

Ideally, the preschool and school years should be years in which the limits of each child's world expand enormously. Language is a central tool in this opening of the world. Through language, both oral and written, children develop knowledge of their own world and of other people's worlds. The English Profile talks of attitudinal outcomes of enthusiasm, discrimination, and confidence. The Profile also describes ability outcomes which include being able to function in different contexts, being able to make decisions about language use, understanding how language works in different contexts and realising how language is connected with power.

Herein lies a dilemma for educators. Christie (1986, p.23) speaks of the importance of language learning as *a necessary part of learning to act with independence and consequently with power over the course one's life takes*. But power in our society is not shared equally. What is more, the new curriculum frameworks make it clear that it is part of the role of teachers to help children understand this. This raises the issue of the purpose of education—whether it is to socialise children into the existing societal structures, or whether it is to produce change agents. As Hill (1995, p.23) reminds us, there are two major curriculum forces currently at play for teachers:

- *first, increased pressures towards accountability which include standardised testing, a focus on outcomes, and a national curriculum; and*

- ***second, post-modern orientations which challenge us to look at power relationships and at ethnic, racial and gender relations in what we teach and how.***

Long-term goals for children must be clear. Some goals are generally accepted, however, goals of empowerment and social change, especially by minority groups, can be hotly debated. Most people in Australian society want all children to have a good command of standard Australian English, both spoken and written, as it is the national shared language—the language of power. A growing number of people want all children to know a language other than English as well. This can be a central factor, in the words of the English Profile (1994, p.8), in the process of ensuring *that students develop an ever-widening language repertoire for personal and public use*, so that they are able to use language to express their identity—feelings, values, beliefs, fears; to relate to others who are like them and to others who are different from them; to create imaginary worlds; to challenge, to solve problems; to play games; to sing songs; to joke; to negotiate; to reflect, dream, question, hypothesise and so on. Children also need to know *about* language—how it works, how it changes in different contexts (e.g., family, school, church or from one ethnic group to another or from one country to another) and in different modes (e.g., oral, written, multimedia), and how it is related to power and to stereotypes.

For many children, particularly those from English-speaking backgrounds, the empowering process which Christie describes is what happens. For children who speak English, English-speaking teachers are more likely to follow normal principles of good teaching, such as starting where the child is and building upon children's existing bases of knowledge and experience, moving from the familiar to the unfamiliar, from the known to the unknown. Goodman (1989, p.113–4) suggests that these principles are behind the Whole Language approach to literacy which she traces back to Comenius in 1897.

Comenius

> *...believed that children can discover new information by being introduced to what is familiar to them within their life experience, by being able to manipulate the concrete objects studied, and by using their native language* to talk about what is being learned (cited in Goodman 1989, p.113–114).

Most teachers of young children would agree with Comenius. It is necessary to start with what is familiar to the child and to move outwards from there, gradually extending the range and scope of what is familiar. If staff are monolingual, they can follow these principles much more easily with children who share their language than with children whose home languages are different.

Particularly for children whose home languages are languages other than English, the process of early education, especially in the mainstream classroom, can be very different from one of empowerment. For many of these children,

> *the process [of education] is one of disempowerment, as the language which they have learnt in the home environment and which has functioned adequately for them is suddenly rendered useless. They may not be able to communicate with their teachers, caregivers or peers. The situation is made worse when teachers or caregivers ignore children's competencies in languages other than English and focus only upon the fact that they do not know English.* (Makin et al., 1995, p.100)

To keep children's languages separate when their language development is being assessed is analogous to the situation of the six blind men describing an elephant. One blind man felt the tail and said, *an elephant is like a rope—long and*

thin. One felt the trunk and said, *an elephant is like a snake—long and rubbery*. One felt the tusk and said, *an elephant is like a knife—sharp and smooth*, and so on. No one agreed and all argued over what an elephant is like, until the elephant said, *Excuse me. Everybody is right. My trunk is like a snake. My tusks are like knives. My ears are like big leaves. My legs are like trunks. My sides are like walls. My tail is like a rope.*

When children's language development is profiled, an holistic approach must be taken which includes assessment of their development in all their languages. A teacher who says of a child, *he (or she) has no language*, is often not describing the child accurately. This statement is often used by mainstream teachers and child care workers to convey the information that the child's *English* is not fluent. The fact that the child speaks fluent Portuguese, Cantonese, Vietnamese, Auslan, or whatever, is ignored and is not a conscious part of the assessment of the child's abilities.

The profiling of children's language development has certain inherent dangers which need to be considered. One of these dangers is that the profiling of bilingual children is often done in isolation by different teachers, without the team cooperation and consultation necessary to present an accurate, holistic profile of an individual child. Mainstream programs are most commonly English-only programs, sometimes with ESL or LOTE support, but, even where it exists, such support is often inadequate. The ESL program and the LOTE program may be separate from the mainstream program and separate from each other. In the mainstream classroom, not speaking English may be seen as a problem rather than a potential advantage or, at best, as irrelevant to the concerns of the mainstream classroom.

These perspectives, i.e., that not speaking English is primarily a problem to be remedied, and that languages other than English are peripheral to life in the mainstream classroom, appear evident in the section of the English profile (p.3) which lists underlying key assumptions.

Key assumption no. 6 indicates that languages other than English are peripheral. It says, *'Students' experiences with using English and other languages beyond the school are essential considerations for teachers when constructing teaching and learning outcomes, and in order to gain insight into students abilities. The profile, however, focuses on outcomes and experiences typically available to all students within the classroom and school.'* (English: A Curriculum Profile 1994, p.3)

In a class in which there are 28 children representing 10 language backgrounds, only one of which is English, what is *typically available to all*? Perhaps it is experience of difference. Perhaps this should be the starting point.

Key assumption no. 7 expresses a disadvantage perspective—*Sound pedagogy includes particular attention to...[C]onstructing teaching and learning programs that recognise the learning needs of individual students and groups of students in order to make the learning outcomes described in the profile as achievable by all students. This is particularly important for students recognised as having been disadvantaged by the Australian school system* (English: A Curriculum Profile 1994, p.3). One such group is identified as *students from non-English-speaking backgrounds*. There is evidence to suggest that development of a strong base in the first or home language may be a central need of bilingual children in terms of their eventual level of fluency in English as well as in their first language (Cummins 1979 and elsewhere). A recent story in the *Sydney Morning Herald* reported a study carried out by the Institute of Family Studies which suggested that preschool children from LOTE backgrounds did less well on various tests, than did English speaking children. It is hardly surprising that children tested in a language in which they are not fluent do not score well, a fact which was capitalised upon in Australia's past history of immigration by the infamous 'dictation test' (Dugan & Szwarc 1984). It is also inappropriate to administer most of the commonly used ability tests, including IQ tests, to preschool children (Sattler 1992).

Learning through language

It is often the mainstream teacher who is central in the reporting of assessment as well as in the carrying out of assessment. Yet, as Mills says, *Without bilingual skills, teachers are trying to find the best high-jumper by seeing who's best at running* (Mills 1993, p.60).

Teachers today are faced with ever-greater challenges. The children in their care are increasingly diverse. There are increasing expectations that teachers will be surrogate parents, social workers, moral educators, philosophical educators, etc., etc. Many early childhood educators feel that, when they themselves are monolingual and when the children in their classes speak so many different languages, the question of building upon the experiences of all the children is just too hard. However, it is essential to find ways to make this happen.

A shared load is not as heavy. Educators need to look at ways in which early childhood workers, mainstream teachers, ESL teachers and LOTE teachers can share their knowledge, experience and skill to a greater extent than may currently be the case. However, study of the different Profiles and Scales reveals little evidence, apart from token references which appear to leave all of the hard work to individual teachers, of a systematic linking of content and expected outcomes for bilingual children, not only in terms of English but in terms of all of the key learning areas. In many States now, there are moves to link the ESL Scales with the KLAs (Key Learning Areas in the school curriculum such as English or Studies

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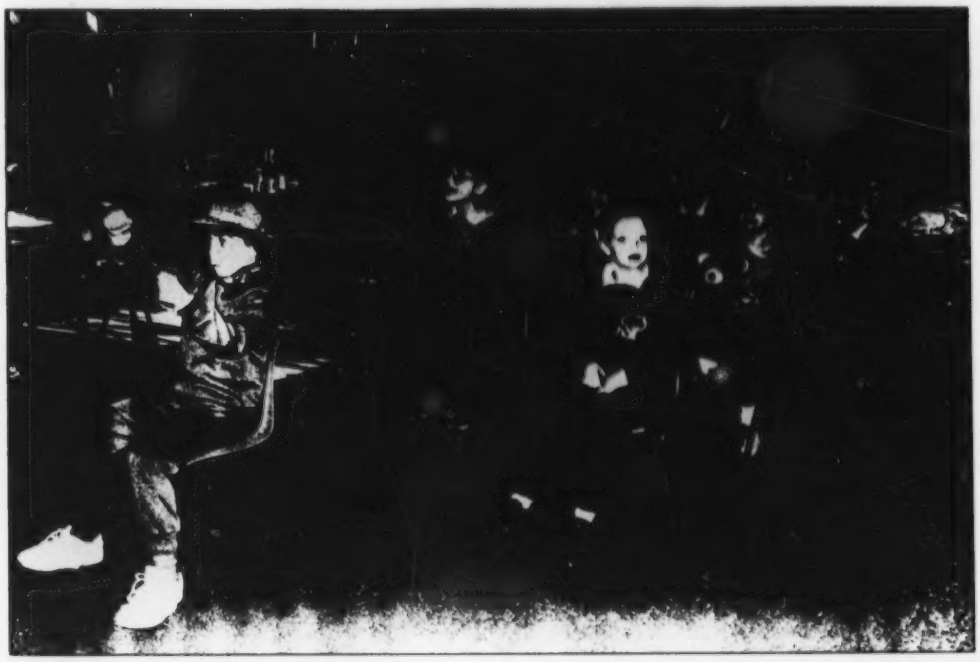

Metalinguistic awareness: multilingual settings can offer many learning experiences denied to children in monolingual setting

of Society and Environment). However, moves to do the same with LOTE or, even more important, to link all three, are less common. There seems to be an implication that the teaching and learning in the three areas is separate, whereas, as stated earlier, English, LOTE and ESL should all be integral parts of whole centre/school language programs and, especially for young children, language learning should be content-based, i.e., not a subject in its own right.

In our diverse society, every teacher will, at some point, be working with children whose home languages are languages other than English. Every mainstream teacher must be a teacher of English and must accept and validate languages other than English. Most ESL children are part of the mainstream for the greater part of each day even when there is a degree of ESL support and/or LOTE support.

Play is one avenue in which cooperation between mainstream teachers, ESL teachers and LOTE teachers can be very fruitful.

According to Rogers and Sawyers (1988), defining attributes of play are that children are actively involved, that they drive the process and determine the rules, and that there is a focus on process rather than product. Wyver (1995a) summarises three ways in which early childhood professionals consider play: as a context in which development occurs; as a process through which development occurs; and as an outcome which signals development (for example, less solitary and more parallel play).

There are many types of play. Vygotsky (1978) saw representational play as a leading factor in social and language development. In the early years of school, certain aspects of play become more important. One of these is the increasing importance of rule-based play, as in games playing. Games can be used as a basis for exploring ways in which collaboration between mainstream and specialist teachers and between school staff and the community can be developed (Makin 1992). This occurred in 16 schools in the Metropolitan South West Region

of the Department of School Education between 1988 and 1993 in a project called ASPIRE (Approaches to Student-Produced Instructional Resources in Education).

In ASPIRE, children produced games which could be used as teaching resources with other children. Mathematics was the key learning area within which the games were situated, but, as language is an inextricable part of all of the key learning areas, language was a central focus. Initially, games were developed in an English-only context, but with increased awareness of the potential of using previously untapped resources, the games became bilingual or multilingual. Many of these resources were people—bilingual teachers, older bilingual children, community workers, family members.

A rich source of observation and assessment is offered by this sort of project. There are the processes of decision-making—what type of game will be produced, for whom, with what rules, how will it be presented. Oral and written skills in both English and children's home languages are used. Mathematics, language, and literacy combine happily in a child-directed, game-playing situation. Many of the games were shared, not only with other children, but with families. Preparation for this involved other experiences such as consulting the calendar to choose a suitable date, writing invitations in the appropriate languages, planning the menu, shopping, preparing the afternoon tea, welcoming parents, and so on. Children's home languages were an integral part of this process as well as the process of developing and playing the games. One of the parents wrote:

> *This project proved that the children are at no disability having come from ethnic backgrounds, and, interestingly, have enhanced the work by giving it a different view and involving children's parents that normally would not assist in everyday school work…I personally found it interesting to assist my daughter in writing grammatically correct Polish even though I come from an ethnic background and thought that I would never have to draw on my linguistic Polish skills in my daughter's schooling.*

ASPIRE was an intervention project with a duration of one term only, not a full bilingual program. However, it is one example of how classroom teachers, community members and children can work together in a way which addresses the concern of Comenius referred to earlier that all children should be able to use their native language to talk about what is being learned.

Increased use of children's home languages in mainstream programs and more consultation and cooperation between English, ESL and LOTE teachers in children's assessment works for the benefit of bilingual children. As Swain, Lapkin, Rowen and Hart (1990, p.111) suggest, *when the second language* [which, for bilingual children entering the Australian educational system, is most often English] *is required for academic success and participation in the target language society, the provision of a sound first (home) language basis which includes literate activities is a wise investment*. This notion is also evident in Dawkins (1991) in which it is stated clearly that *the development of initial literacy in the first language is desirable for personal development as well as for development of literacy in English* (1991, p.9).

Section 2:
Communication-based assessment

The theoretical perspectives of early childhood educators influence their practice. How teachers plan for children and interact with them will depend upon how they believe children learn. There are three basic theories which explain how children learn language: behaviourist, nativist and interactionist. The perspective taken in this chapter is the interactionist perspective in which learning is social and interactive in nature. In this view, cognition originates in social interaction and is only later internalised. In interactionist approaches (e.g., Halliday 1975; Vygotsky 1978), the role of the adult is critical to children's learning, providing structure and support, with meaning-making the paramount focus. Knowledge is seen as a social construct with child development determined not only by inherent factors (Piaget 1959; Chomsky 1965) but also by external factors (Rogoff 1990; Halliday 1975). Acceptance of this approach supports the earlier point about the importance of a team approach to language profiling. Gradually, the role of context is not only becoming recognised, but foregrounded. As Bradley (1995, p.1) writes, *development cannot be studied in isolation from...social relationships. Development can only be understood if researchers consider and involve all the agents who help to produce the immediate culture from which children emerge.*

In discussions of the theoretical underpinnings of an educator's approach to language teaching and learning, theories of how children learn in general and theories of how children learn language in particular must go hand in hand with acceptance of particular language models. The model of language underpinning many of the current language syllabus documents is a functional model. In English, this has derived largely from Michael Halliday's systemic functional grammar (1985) and from Hymes' (1972) notion of 'communicative competence'. In ESL, it derives largely from the functional/notional approach to language teaching which emerged in the 1970s (e.g., Wilkins 1976; Widdowson 1978). Functional models emphasise the relationship between the context and the language used. Language is seen as a set of resources which will be used in different ways in different situations. Part of children's language learning is what the English profile describes as becoming aware of school expectations for language use. Some of these expectations are quite different from experiences which the child has had with language prior to school. There are at least four inter-related language competencies which children need to be effective communicators in any situation. These may be very different in early childhood education than they are in a home situation. The four competencies are:

1. **Discourse competence**
   For example, knowing how to enter a conversation, how to interrupt, how to change topic. Young kindergarten children, for example, learn to bid for attention by putting up their hands and sitting up straight. How does a child learn that,when the teacher says, *I can see Kassim's beautiful brown eyes,* this is a generalised call to the group to pay attention to the teacher? Experience leads to the development of discourse competence.

The ESL Scales refer to two different aspects of discourse competence—operating strategies which make participation in discourse possible; and acquisition strategies which enable children to enhance their learning of English. Acquisition strategies are also needed by young children who already speak English. They still need strategies which enable them to compensate for less than full fluency, as when an English-speaking three-year-old says, *want that thing puts music in my ear* (i.e., a Walkman) or *kiss my [d]is* - pointing to a bumped elbow.

In the ESL Scales, an identifiable and important stage in the development of discourse

competence is omitted. This is the Silent Period in which children learn through observation and non-verbal participation in activities. Omission of reference to this stage is an example of a weakness in the Scales as a whole, i.e., an underemphasis on listening and on learning through observation;

2. Sociocultural competence

A second area of language competence is sociocultural competence —knowing that language changes according to the roles and relationships of the interlocutors—who is communicating with whom, via what mode, about what, and in what situation. It is not appropriate for a child to say, *See ya, mate,* when farewelling the school principal. It is not appropriate to present a scientific report in the form of a limerick or song.

One of the most noticeable features of classroom discourse is the use of display questions, i.e., questions in which teachers invite children to display their knowledge. Children must wonder at first why they are asked questions to which the teacher obviously knows the answer—*What colour is the block? How many eyes does the teddy bear have?* Part of their development of discourse competence in this situation is to learn to respond appropriately.

An explicit focus on the differing expectations of different types of written communication is offered by the Genre Approach (Rothery & Martin 1986). Mastery of a range of different genres is part of the development of sociocultural competence.

Included in assessment of a child's sociocultural competence will be observation of the range of social contacts which a child experiences, either initiating or responding.

3. Functional competence

A third area of language competence is functional competence—being able to use language for a range of purposes. There are a number of functional typologies, e.g., those of Halliday (1975) and Tough (1977). Such typologies typically include language for individual expression, for forming relationships with others, and for developing a world view. Language for learning (e.g., reasoning, hypothesising, predicting, explaining) should be a major focus in school language.

4. Linguistic competence

The fourth area of language competence is linguistic competence—knowing about the features and structures of different languages, how they work—and being able to use this knowledge in composing and comprehending texts, remembering that languages work differently—word order, plurality, speaker and interlocutor identification, identification of direct and indirect object, to give just a few examples, may be quite different in different languages. Think, for example, of the English sentences—*The fisherman gave his wife the shark* and *the fisherman gave the shark his wife.* A simple change in word order has a profound effect upon who gets eaten! But such a change is signalled quite differently in other languages. The change of word order which signalled the change in meaning in the English sentences would not serve the same purpose in many other languages. Story structures, conventions of print, purposes of literacy may all be different for members of different language communities.

Sociocultural competence: knowing that language changes according to the roles and relationships of the interlocutors

Developing language competencies

If educators want children to develop all of these competencies, a central implication is that it is important to ensure children are given opportunities to experience language use in a wide range of different situations. Language, like anything else, is learned through exposure, involvement and practice over long periods of time. It is also important that teachers learn as much as they can about the languages of the children with whom they work. It takes a long time to learn a language beyond the level of social survival skills—between five and seven years before children whose first language is a language other than English can be expected to *perform academic tasks equivalent to those of their English-speaking age-grade peers* (ESL Scales, p.3).

The ESL Scales suggest that at Level 3, K-2 children can be placed on the English profile and presumably be assessed along with native speakers of English. However, not keeping at the forefront an understanding of children's home language experiences can lead to inappropriate observation, e.g., Outcome B1.3 is *handles a book appropriately, showing some awareness of conventions of book and print organisation* (ESL Scales 1994, p.3). Appropriate handling and awareness of conventions of print may be very different for an Arabic child, a Korean child, and an English child.

Play offers a particularly appropriate avenue for increasing the range of language experiences which children experience. In a meta-analysis of 46 studies and child development, Fisher (1992, p.52) found *'convincing evidence of the impact of play, which appears to promote improved performance outcomes in both cognitive-linguistic and affective-social domains.'* Berk (1994, p.30–1) reiterates Vygotsky's notion that *[P]lay creates a zone of proximal development in the child. In play, the child always behaves beyond his average age, above his daily behavior; in play, it is as though he*

were a head taller than himself. As in the focus of a magnifying glass, play contains all the developmental tendencies in a condensed form and is itself a major source of development. However, Berk reminds us that this is so only when adult involvement in play takes the form of joint construction building upon children's scenarios, not when play is adult-initiated and directed.

A play-based program for at least a portion of each day can facilitate a move by both children and teachers beyond the restricted language interactions of grouptalk. Teachers are usually aware of the need not to dominate children's play and so may be more ready to observe and to restrain from taking over.

In the previous section there was reference to the devising and playing of games. Other types of play are also valuable in terms of children's learning. One type of play which appears to benefit children's development in many areas is sociodramatic play. Such play can arise from children's personal experiences, from TV shows, from books, and so on. Many studies (e.g., Smilansky 1990; David 1990; Simons 1991) support sociodramatic play as beneficial to children's cognitive, emotional and social development as well as their language development. Collins et al., (1994) cite a number of studies relating sociodramatic play to the development of divergent thinking and to academic achievement. Play has also been linked positively with children's comprehension of stories (Pelligrini, cited in Wyver 1995b). In sociodramatic play children can take on many different roles and can devise a multitude of reality-based and imaginative situations. Even very young children take on a totally different tone of voice and express very different messages when, for example, they take the role of the baby rather than the parent or vice versa. Many of the language competencies described earlier can be developed through the provision of repeated and extended opportunities for sociodramatic play. Such play offers teachers a very rich field for observation, insight and understanding as to a child's range of competencies and level of ability in each area of competence.

Another type of play is exploratory play, often using materials available within preschool or school settings. Many disputes about the use and control of resources arise during play. Negotiation of the control of resources can assist in competency development. For the play to continue, the disputes must be dealt with. Dispute management can require discourse competence (controlling the way the dispute is going); sociocultural competence (knowing what is expected behaviour by other people in the situation who may be called upon as allies); functional competence (being able to express one's desires in a way that convinces others) and linguistic competence (having the lexicogrammatical resources which may help avoid settling the dispute by physical means). The following text of two children engaged in a dispute over possession of a tin of playdough demonstrates impressive sociocultural competence.

Su: I want to tell you something, Kevin. *(Putting scales on table)*. You have this *(scales)* OK? And I have that *(playdough)* OK?

(Kevin hits the top of the tin, shakes his head, puts the tin on the scales. Su takes the tin and walks away with it)

Su: I make it for you…me and you make it OK *(walking away with the tin)*…me and you make a sandwich…we're together. You share OK? *(She walks away with the tin)*

Kevin: No, I don't want to share. It's so bad, it's so bad.

(following): throw it in the rubbish. Throw it in the garbage…

Su: Mrs Robbins, he doesn't let me share with him.

(calls the teacher)

(Makin & Rieschild 1992)

In this fragment of text, Su shows a keen awareness of dispute management strategies. She provides alternatives (the scales) and offers joint collaboration (although, in this instance, her words and her actions are at odds). She also shows a knowledge of what teachers expect of children who are quarrelling over material resources, i.e., that they will share materials, when she accuses Kevin of not letting her share the playdough with him. She puts it quite subtly. Obviously, she wants to retain possession of the playdough tin. She wants to be the one in charge, the dispenser of the playdough, but it is Kevin who is put in the position of the selfish one who won't allow her to be bountiful and share the playdough—*He won't let me share with him*!

Play also gives children opportunities to consolidate lexicogrammar. An example of developing linguistic competence is evident in this short text in which Arabic children are struggling with vocabulary recall of English words during small group constructive play:

T: When you go to Featherdale *(a nature park)*, do you think you'll only see kookaburras and snakes?

C1: N...special do—special dogs

T: What are the special dogs called? They start with d...ding...

C2: Dingdong

C1: Dingdog, it's a dingdog

C(ESB): No, no, no, it's a dingo

C2: *(Sings to the tune of 'Old Macdonald had a farm)'*

Dingo was his name-oh. *Ee-i-ee-i-oh, Dingo was his name-oh.*

(Makin 1994)

Play offers appropriate avenues for increasing the range of language experiences

The children's attempts at vocabulary retrieval include making phonological approximations (*dingo* and *dingdong*) and semantic approximations (*dingdog* and *Dingo* versus *Bingo*). Categorisation is evident in the association of native animals with songs about farm animals and domestic animals. These children's problem is not a conceptual one, but one of lexical retrieval. Play offers a relaxed atmosphere with a low socioaffective filter in which retrieval and practice can take place.

Section 3: Teacher talk

(NB: This section draws upon material contained in a paper delivered at the Australian Research in Early Childhood Education Conference, University of Canberra, 1995.)

There is a need to ensure that children's home languages are included in preschool and early school programs, to share perspectives on children's development in all their languages, and to give children opportunities to develop a wide range of language competencies. Even though in Australia, great strides in language teaching and learning have been made over the last decade, to the point where Australia is a world leader in language policy and planning, there is still a long way to go. One of the areas which would reward self-assessment and attention through professional development courses is increased attention to teacher talk.

Unfortunately, many studies of classroom talk at both preschool and early school levels suggest that teacher-child interactions in educational settings are surprising in their narrow range. It may be the perceived need to manage a group which perpetuates this pattern. It may be (and this can be an increased danger with moves towards standardised testing) pressure to achieve curriculum outcomes for all children in a particular band rather than individual child-oriented outcomes growing out of informed observation.

More research has been carried out in primary schools, usually in whole class situations, than in child care centres. A summary of features of classroom talk in primary schools, as supported by many research studies, gives a somewhat depressing picture:

- child-initiated sequences are rare (Barnes & Todd 1977);
- turns are very disparate with teacher talk dominating between 66 and 70 percent (Mehan 1979; Cazden 1988; Reid, Forrestal & Cook 1989);
- in a 45-minute period, the amount of time left for a class of 30 to contribute is an average of 20 seconds per pupil (Bullock Report 1975);
- questions asked by teachers are primarily low level, requiring recall of factual information. Questions are the province of the teacher, and are usually display questions (Perrott 1988); and
- students respond with one word or one sentence answers (Perrott 1988).

Perhaps talk in early childhood programs is different. The higher adult–child ratio, smaller groups and child-centred program might lead one to expect that, in early childhood centres, interactions may be of a higher quality. However, a recent study in child care centres (e.g., Makin, White & Owen, in press) suggests that this does not appear to be the case. Even in small group situations, teacher–child talk in early childhood centres was found to possess very similar characteristics to teacher–child talk in whole class primary classrooms.

As well as the areas mentioned previously, a number of other studies have found many limitations in verbal interaction in early childhood programs, e.g.:

- little use of language for reasoning, predicting, problem solving (Tough 1977);
- a more limited set of conversational options than is present in the home (Wells 1981);
- little sense of intellectual struggle and of real attempts to communicate (Tizard & Hughes 1984); and
- lowered expectations for children from ESL backgrounds (Makin 1983; Torr 1993).

Play can be a very good starting point within which teachers can change their practices. Perhaps more so than in any other area of the curriculum, teachers are aware of the need not to dominate play, to allow children to choose directions for development, and, as long as problems which appear unsolvable by the children do not arise, teachers are more likely to intervene to facilitate and extend rather than to test and direct.

Teacher talk is closely connected with teacher leadership style. In a classic study in 1939 which has been replicated many times with similar results, Lewin, Lippitt & White (1939) investigated leadership style. During a five month study, groups of 10-year-old boys involved in craft activities were exposed to different leadership styles. The same groups behaved, differently with different leaders, both in the presence of the leader and in the leader's absence. Each leader deliberately changed leadership style with each group. That this is possible implies that leadership style is not the same as personality type, is not inborn, and can be adopted deliberately. The same individual leader produced different behaviours according to the style being manifested at that time.

The three leadership styles studied by Lewin, Lippitt & White were *laissez-faire*, democratic, and authoritarian. In my own work, carried out in early childhood settings, I have suggested that some teachers manifest a fourth style, the predominant style. The predominant style includes some of the characteristics of the democratic leader, e.g.:

- involving children in decision-making (e.g., choice of workmates or playmates);
- letting children in on the 'big picture'—why certain expectations are present, what the goals of activities are; and
- involvement in the group by the teacher.

The predominant style also includes a focus on the development of judgement, responsibility and self-motivation and on the development of metalinguistic and metacognitive awareness. The predominant style may be manifested in a seemingly authoritarian manner with a high incidence of commands, for example. However, examination of the context and goals of the interaction reveals that predominant teachers are commanding children to think, vote, decide, choose, and so on, which is quite different from commanding them to sit still or to be quiet and, over a period of time, would be expected to result in children with a different sense of empowerment and responsibility.

Since a defining characteristic of play is child-directed process, play offers excellent opportunities for teachers to develop their ability to use democratic or predominant leadership styles rather than an authoritarian style because, during the course of play, they are positioned either within a child-directed group or as peripheral to the group. This is not to say that, when they are interacting with children during play, they should be demonstrating a *laissez-faire* style in which they play a reactive role only. It does mean that they must be sensitively attuned to the children's interests and assisting them to expand and elaborate their play.

Conclusion

There is sometimes a tension between child-centred learning and curriculum-centred teaching. If the language Profiles and Scales are used to make judgements about children in terms of expected curriculum outcomes, they can be detrimental to young children's development. If they are used as a way of understanding children's emerging interests and abilities, they can provide teachers with useful information on which to base planning. A number of years ago, Robert Graves, in a paper delivered in Sydney, said, *Slow down, listen, and let the child lead* (personal notes). Tuning in to children can help early childhood educators learn more about their development. Interacting with them in child-directed activities such as play can help educators reflect upon their leadership style. Increased self- and other-awareness can in turn help educators to resist pressures towards accountability measures and outcomes which they think are inappropriate. Whole centre/school responses to children's language needs are more likely to ensure that assessment is child-centred and communication-oriented.

The Macquarie Dictionary defines the verb, *to play* as *to amuse oneself or toy, to do something only in sport, which is not to be taken seriously.* This definition is not appropriate in an early childhood education context and should be rejected in favour of the insight of Montaigne (cited in Partington 1992), who wrote in 1580, *Il faut noter, que les jeux d enfants ne sont pas jeux, et les faut juger en eux comme leurs plus serieuses actions*, or, in translation, *It should be noted that children at play are not playing about; their games should be seen as their most serious-minded activity.*

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